The Business Journal of Vegetation Management August 1979/$1.25

WEEDS TREES & TURF

Out of Season Digging and Transplanting

History and Characteristics of Growth Regulators

Chain Saw Safety and Use

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RAM I Kentucky bluegrass is in no way connected with RAM of the Colgate Sports Group of Companies.

WT&T

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Cover: From just released audio/visual program by the National Arborist Association on Chain Saw Safety and Use.

For the turf you care for: proven protection against nine damaging diseases from America's leading fungicide for turf. Now a 500 gram per liter flowable formulation.

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LETTERS

Let Bergland Know!

I am very pleased with the support of the Cooperative Extension Service you espoused in your editorial in the June issue of WTT. It is right on the mark!

Being a Horticulturist myself, and having my staff responsible for the educational aspects of the very successful GREEN INDUSTRY Seminars in the Detroit area, as well as being involved in educational programming with the metropolitan Detroit Landscapers Association, the Michigan Association of Nurserymen, the Michigan Turf Foundation, the Sod Growers Association of Michigan, the Metropolitan Detroit Flower Growers Association, Michigan Forestry and Parks Association, and others, most of which we were instrumental in forming, I can appreciate your sentiments exactly.

Keep up the good work. The Appropriations Bills, from both the House and Senate, have still to be acted upon. The House Appropriations Committee reported out a requested increase, above the President's Executive Budget, of $16 million for Extension and $11.5 million for agricultural teaching. Obviously this $16 million is considerably short of the $41.5 million we thought was conservatively needed, using only a 7% inflation factor.

This week the Senate Appropriations Committee will deliberate and we are attempting to have them add another $4.5 million to the Extension budget. This is a tight budget year, and well it should be, but when we have a proven winner, such as the Cooperative Extension Service, in helping American citizens it doesn't make much sense to cut so deeply we find it extremely difficult to effectively function.

It might do a lot of good, for the FY 81 Budget, to let the Secretary of Agriculture Bob Bergland know how WTT feels about the Extension budget. The allocations of dollars within the USDA budget may well be where we can make the most gain and the time is NOW!

Thanks for your concern and help.

Donald D. Juchartz
President
National Association County Agricultural Agents

As a County Agent who works closely with the turf and ornamental horticultural industry, I appreciate your "Viewpoint" on Extension in the June 1979 issue of "Weeds, Trees and Turf."

While Extension may not be the purveyor of all information, many people do not realize that research findings often are passed on indirectly by Extension Agents or Specialists.

I hope the Green Industry will respond to your editorial.

E. V. Chadwick
Extension Director
Pennsylvania State University
Wilkes-Barre, PA 18702

We heartily endorse your opinion expressed in "Viewpoint" in the June issue of Weeds, Trees and Turf. We need all of the help we can get if we are going to be able to continue receiving appropriations from the Congress to fund the important areas you point out in your "Viewpoint."

We are particularly pleased that you will be publishing news about Association efforts in Washington. We have been on this firing line for a long, long time and have been trying to stimulate grass roots' assistance with varying degrees of success over the years.

Actually, in view of budget limitations, overall we have been quite successful in getting money for horticultural programs. As of right now it looks like we will not suffer the budget cuts you were aware of when you wrote your "Viewpoint." Congressman Whitten, who is Chairman of the House Appropriations Committee and is a very strong individual indeed, is insisting that all research cuts be restored in Conference. We are strongly supporting his effort.

For whatever interest it may be, I have enclosed a copy of the American Association of Nurserymen testimony on the subject of agricultural appropriations. You will find that we dwelled at some length on the problem facing State Experiment Station Research.

One other point which involves terminology. In your "Viewpoint" you used the term "ornamental and turf" several times. I would like to suggest your consideration of using the term "environmental" in place of ornamental. We have been trying to spread this word for several years and have made some progress. I have enclosed an excerpt from testimony before the Agricultural Appropriations Subcommittee given some years ago. This is proof enough of the need for getting away from the term "ornamental." I think environmental plants is an all encompassing term that you may consider. It would include turf also. Turf too, has its image problem when it comes to getting money for research from the Federal government. The less we get specific, the better off we are.

We are most anxious to work with you and will welcome any contacts your reporters would like to make with us, either personally or over the telephone. We try to keep abreast of all legislative matters affecting the industry, and when we cannot give an answer right away, we will surely chase it down and get back to you as soon as possible.

Robert F. Lederer
Executive Vice President
American Association of Nurserymen, Inc.
Washington, D.C.

I've delayed over-long in writing to commend you on the editorial concerning the loss of experiment station personnel to industry — mostly turf oriented. It is a grave situation! In pirating good turf people away from the universities, industry realizes that they are getting highly trained individuals. The industrial people can outbid univer-

sity administration because the very people they are hiring have helped them to make the kind of money by which they can raise the bid.

Industry has a moral responsibility, an obligation, to help finance the graduate students who must be trained to replace the people who have been hired away from the colleges. Every industrial firm engaged in "turf-for-profit" (equipment, irrigation, seed, sod, chemicals, fertilizer, etc.) could afford to budget a given amount each year to donate (tax-free) to the industry foundations to help train these replacements.

Fred V. Grau
President
Musser International Turfgrass Foundation
College Park, MD

I serve as head of a department that is primarily horticulture, but with some forestry, and my own background is in physiology and culture of vegetable crops. I am very supportive of work in the area of ornamental horticulture or the "green industry" as you call it, and I especially appreciated your "Viewpoint" in the June 1979 issue. I think you are right in believing that only continuous pressure from the industry and its consumers will get a fair share of research and extension effort devoted to this area. The picture today is quite in contrast to that of the late sixty's and early seventy's when everyone was wanting to ride the "environmental horse" to greater support for their pet area. I certainly wish you success in your efforts.

I have tried to gain a broad viewpoint and some knowledge of all areas of horticulture since becoming department head. Your June 1979 issue of Weeds, Trees and Turf was full of information that I have digested. In fact, I don't know when I've seen a trade magazine with more information in it. Congratulations.

George Bradley
Professor and Head, Horticulture
University of Arkansas
Fayetteville, AR

Don't Meddle With Intrusion.

As a practicing urban forester, I feel compelled to reply to an article in the June, 1979 issue of WT&T, "Urban Forestry Suspected as Intrusion".

I work for the Virginia Division of Forestry, a state agency, as a Forester-Planner. As the title implies, I spend a good deal of my time working with state, regional, and county planning organizations to conserve the forest resource of Virginia. The rest of my time, however, is spent practicing urban and community forestry.

My job responsibilities include all the technical assistance programs mentioned in the article plus some others, including:

— promotion of all Division of Forestry programs, including forest management and forest fire protection,
— providing technical assistance to individual's or groups wishing to undertake environmental projects; eg. greenbelts, wildlife areas, parks, soil erosion and sedimentation prevention, watersheds, etc.
— review and comment on all Environmental Impact Statements concerning the forest resource in rural and urban areas
— education of the public in complying with State Water Quality guidelines known as Best Management Practices (BMP's) in accordance with Federal legislation 92-500, the Clean Water Act.

What do these have to do with this magazine article? You have assumed that we "urban foresters" are meddling in the affairs of practicing arborists. We are, first of all, foresters; and as such most of our concern is placed on the forest resource as a whole. We have no intention of interfering with private enterprise, especially arboriculture, which concerns itself with the care and maintenance of urban trees. Rather, it has been my experience that our work promotes the work of arborists. Any tree ordinances that we may help to write and implement for communities encourage tree care and thus provide work for tree care firms. Whenever we provide any insect and disease control recommendations to the public, we also recommend the use of arborists (we are not allowed to suggest specific companies or individuals) to implement these controls. Finally, any municipally-owned forest land that we develop management plans for usually belongs to a municipality that requests our assistance or cannot afford a municipal arborist of its own.

Mr. Felix has suggested, according to your article, that the moneys provided for urban forestry under the Cooperative Forestry Assistance Act may lead to the formation of a federal agency to regulate the "urban forest" industry. In these times of federal budget cuts and government penny-pinching, do you think this argument is valid? Five pages previous to this article, you are encouraging action to stop the loss of Agricultural Extension personnel. Why then are you "biting the hand that feeds you" in this article? Foresters should not be "suspected", as you put it, of intruding into the world of arboriculture. We are an information source, as extension personnel are, and can work together with arborists to provide a valuable service to our urbanizing population.

Matthew J. Simons
Forestry-Planner
Commonwealth of Virginia
Sandston, VA

Take a good look at OSHA, EPA, HEW. Good intentions in every case, but tremendously harmful implementation at the cost of American business. Mr. Felix wasn't implying that the person, the urban forester, is the intruding party. Rather, he rightly projected past bungling in Washington, D.C. to arboriculture in cities. He warned of the possibility of poor implementation. He is saying, look before you leap bureaucrats.

Please don't confuse our stand on urban forestry with extension horticulture. They are separate issues despite overlap. In fact, it is the same bungling that is threatening to seriously reduce extension help to Green Industries, that can derail good intentions to restore forests to our cities. The Editor

GREEN INDUSTRY NEWS

SEED

Ryegrass purity test subject of debates

Three debates among administrators of the Federal Seed Act, perennial ryegrass growers, breeders and distributors, have taken place in the last eight months over the reliability of a fluorescence test for off-type perennials and annual ryegrass in fine turf type perennial ryegrasses such as Manhattan and Pennfine.

The first debate took place at the Golf Course Superintendents of America Show in Atlanta last winter. The second occurred during a symposium in Oregon in April, and a third in Washington, D.C., in June at the American Seed Trade Association's meeting.

Controversy centers around a test added to seed label regulations in 1972 which was further described in a letter of explanation by Federal Seed Act Administrator Clyde Edwards in 1973. The addition to the regulations required that the label should specify percentage of fluorescence on the seed tag.

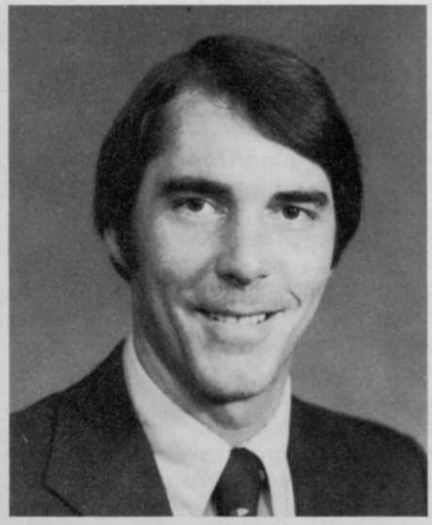
The regulations have never been enforced and the test and the regulations are now the subjects of debate among regulators, growers, breeders and distributors.

In the test, suspected off type seeds, are germinated and the seedlings placed under ultraviolet light. The concept is that the fine-leaved perennial ryegrasses will not fluoresce, and annual and offtype ryegrass will. The significance of the test and how its results should be listed on the label are just two of the points of controversy.

The result of the debates was a resolution passed by the American Seed Trade Association asking for a moratorium on the regulation until a study of the test and its effectiveness can be made.

Jim Brooks joins Golf Business staff

Well-known former director of marketing for the Golf Course Superintendents Association of America Jim Brooks has joined Harvest Business Publications Golf Business staff as sales manager.



Publishing Director Dick Foster announced the move in June. Brooks' contribution to GCSAA was substantial as director of sales and marketing for Golf Course Management magazine and manager of the increasingly popular GCSAA Turf Show held annually in the winter.

Brooks' office is located in Harvest's new Atlanta sales and marketing complex.

Ron Morris, technical editor of WEEDS TREES & TURF has been promoted to managing editor of Golf Business and will produce the publication from the Cleveland office.

Foster also announced publication of a new product magazine for the wholesale and retail nursery industry in August. Titled Nursery Product News, the new publication will be edited by Dave Slaybaugh and marketed from the Atlanta complex.

CHEMICALS

Swift Ag Chemical renamed Estech Corp.

In an effort to build an awareness of Estech Corp., a division of Esmark Inc., and to minimize confusion between food and chemical divisions, Swift Agricultural Chemicals Corp. has been renamed Estech General Chemicals Corp.

Swift entered the commercial fertilizer business in 1899 and introduced Vigoro brand fertilizers for the homeowner in 1924. Swift is a major marketer of fertilizers to the turf industry. A few products will retain the Swift brand name.

Other companies owned by Esmark include Swift & Co., Vickers Energy Corp., International Playtex, STP Corp., and Pemcor.

SEED

Bluegrass, tall fescue to rise in price

Bad weather in the Northwest and market conditions for tall fescue seed in the Midwest will result in increased prices this fall, according to seed industry sources.

Bluegrass losses have been estimated by some at 75 percent of this year's production in Oregon, Washington, and Idaho seed fields.

Some Folks Like Their Citation Mixed While Others Prefer it Straight.

Citation is mighty popular around these parts, but there's no need for a shoot-out. Fact is, Citation has a great reputation for fast germination, outstanding heat tolerance, disease resistance, and packs a dark green color. Try it on an area you want to dress up and we think you'll check in your guns and notice an improvement in your disposition.

CITATION

There may be a little room for argument here. CBS is a mixture of Citation, Birdie and Omega fine leafed perennial ryegrasses, blended especially for overseeding for use as winter turf in the south. Each variety used in the blend has a different genetic background to improve overall performance. CBS blend is mighty fast too, so the whole shootin' match could be a stand-off.

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Landscape Contractor News

Construction council backs local compensation

The National Construction Industry Council (NCIC) voiced its opposition to a national workerman's compensation law in a position paper at its recent quarterly meeting, citing flexibility of current state laws and the cost of a national law. Many groups, including the National Chamber of Commerce, have opposed a national compensation law.

In other action, the NCIC will soon have a representative on the Advisory Council to the Council on Wage and Price Stability. The Associated Landscape Contractors of America is a member of the NCIC and will therefore have a voice in wage and price recommendations.

Part-time workers provide advantages

A study by Georgetown University's School of Business has revealed that part-time workers provide savings because of lower fringe benefit costs, reduced overtime, and higher productivity. The U.S. Department of Labor sponsored study also cited problems of supervision and paperwork with part-time workers.

Interior landscapers to meet in St. Louis

The 1979 Interior Landscape Symposium will be held at the Bel Air Hilton in St. Louis, Sept. 19-21. The Associated Landscape Contractors of America are sponsoring the event and its Interiorscape Committee is conducting the symposium.

The three-day symposium will cover a wide range of topics for the interiorscape industry. Its three major focus areas are: maintenance for interior landscapes, interior foliage environment, and bidding and estimating interior projects. An optional half-day tour of noteworthy interior landscape projects in St. Louis will immediately follow the final session.

The "Environment for Interior Foliage Plants" segment will feature a program on "Acclimatization" presented by Leonard Kersch (Garden Milieu, Inc.), and a panel session on "Lighting" moderated by Richard L. Gaines (Interior Plantscaping Consultants).

"Bidding & Estimating" will be a full program presented by a panel of three — a financial consultant, a small-to-medium interiorscape contractor, and a large interior contractor. The three will discuss the process of developing an estimate and bidding on a project, and then will moderate an estimating exercise with the whole audience. For their example they'll use a set of job specifications and a typical contractor's company profile.

"Maintenance for Interior Landscaping" will encompass a series of short presentation on all aspects of interiorscape maintenance: maintenance personnel, crew structures, uniforms, vehicles, procedures manual, work scheduling, client-contact relations, and supervisors.

Discount credit rate for AAN members

Under a plan from the American Association of Nurserymen, the discount rate for VISA and Master Charge credit sales is 1.95 percent for all members desiring to participate.

The AAN received the discount rate after signing a contract with First American Bank, McLean, Va., to handle all VISA and Master Charge sales. The discount rate is the amount deducted from the bank card charges submitted by retail firms to the bank which accepts and processes the charges.

A recent survey of association members showed the average annual volume of sales on VISA and Master Charge is about $50,000 per firm, and the average discount being paid is slightly over 3.5 percent. An AAN firm which fits this description could save as much as $775 a year by participating in this new program.

Jacklin Seed Co. and Pickseed have reported that excessive rain last summer and fall prevented good burns to clean the fields. Doyle Jacklin said the availability of seed will drop as early as November when stocks in storage become depleted. Prices have already increased to slow demand.

Higher production costs and attractive beef prices diverted tall fescue production to feed in the Midwest according to Herman Schulte of Mid Continent Seed Co., in Marshall, MO. Tall fescue prices are expected to reach 45 cents per lb. and level off.

HERBICIDES

Expanded label for ornamental spray

Orthene insecticide has been granted an expanded Tree and Ornamental Spray label by the EPA, according to the manufacturer, Chevron Chemical Co.

The new label will add a significant number of pests. These include aphids on trees and shrubs, tent caterpillars, leafrollers, adult root weevils, and the Nantucket pine tip moth larvae. The spray will also control lace bugs, webworms, scales (crawlers), Birch leafminer, and Douglas fir tussock moth larvae.

For outdoor floral crops, Orthene is now labeled to control lygus bugs on daisies, statice, and yarrow. It is also usable for mealybugs, whiteflies, thrips, and scales on all foliage plants plus orchids, anthuriums, cacti, and poinsettia.

INSECTS

Busier bees make better pollinators

It may be possible to breed busier bees that do more pollinating.

Scientists at the USDA Bee Breeding and Stock Center Laboratory in Baton Rouge, La., are cooperating in a research project on honey bees with the Louisiana State University Agricultural Experiment Station.

Honey bees are responsible for pollinating millions of acres of crops worth trillions of dollars. Even though agriculture has become increasingly mechanized, no substitute for these insect laborers has been found — nor is any likely to be discovered.

More efficient pollination could increase crop production, particularly in areas where bees now have to be brought in to pollinate crops.

The researchers are studying 24 genotypes of honey bees and their activities, and they eventually hope to determine if some are harder workers.

About 8,000 bees from each genotype are confined to a screened-in area in a clover field. Once the bees are released, the researchers wait, watch, and record various facets of bee behavior.

Laboratory research leader Dr. Thomas Rinderer, who has studied bees for almost 20 years, notes that the insects have a highly complex social life, and also engage in a relatively complex sequence of actions as they pursue pollen.

Rinderer, Experiment Station agronomist Dr. Bobby Harville, and several assistants determine how many flowers a particular bee visits during a minute, how many bees are found in a particular square meter of clover during a 30-second interval, the percentage of a blossom that a bee covers while gathering pollen, and the time that a bee spends visiting a flower.

Seventy-five clover plants from which the florets have been removed to prevent self-pollination are covered with bags before the experiments begin. The bags are removed during the experiment, and the plants are covered again when the experiment ends.

Harville then counts the seeds on each plant, an indication of how effectively bees of each genotype distributed pollen.

Other factors may also be associated with more efficient pollination, such as the leg movement of a bee as it visits a flower and how actively the bee digs into a flower during its visit.

INSECTS

Grasshoppers are ravaging Texas

Grasshoppers are ravaging crops and gardens in the Texas Panhandle and are spreading south and east according to Texas A&M University reports.

Counts more than five times serious levels, usually considered eight insects per sq. yd., have farmers banning together to pay for massive applications of malathion.

Malathion, Diazinon, and sevin are primary chemicals used for ornamental uses around buildings and residences.

The grasshoppers lay eggs along fence rows, roadsides, and field margins. Hatching areas can be treated before emergence occurs with a bait of Toxaphene, molasses, and mill-run bran.

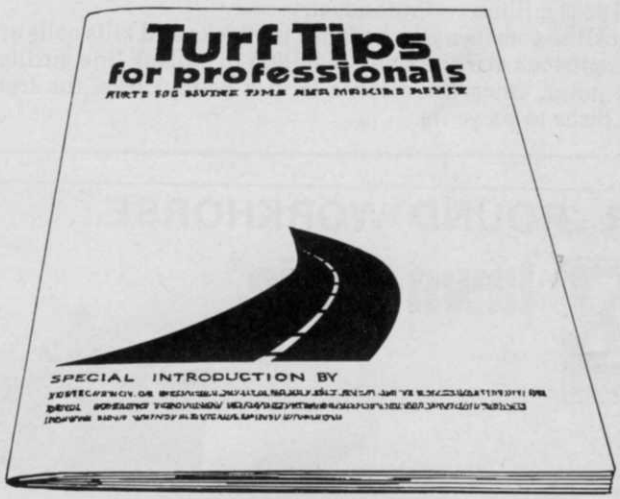
Once the hoppers have emerged, repeat applications are needed to stop migrating insects.

Energy gives sensitive trees needed rest

Light sensitive trees, including elms and sycamores, can now rest that city engineers are playing down the use of bright night lighting due to energy conservation, according to USDA horticulturist Marc Cathey.

Bright night lighting, especially high pressure sodium lights, disrupts the day/night cycle of sensitive trees

We've had so many turf tips we thought we could write a book about them.....



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GOVERNMENT UPDATE

EPA changes registration policy

The Environmental Protection Agency is departing from past policies to speed up the availability of so-called "biorational" pesticides that control crop-destroying insects and other pests through natural means, says Steven D. Jellinek, assistant administrator for toxic substances.

He defines "biorational" pesticides as viruses, bacteria, protozoa, fungi, and certain naturally occurring biochemicals that either attract, retard, or destroy pests. These pesticides, Jellinek says, should be easier to register than conventional chemical pesticides, which are inherently toxic.

Jellinek made the announcement at the opening of a new plant in Wasco, Calif., which will produce an insect virus lethal to cotton pests but harmless to people and the environment.

Virus causes walnut tree disease

A U.S. Dept. of Agriculture plant pathologist has discovered a virus that produces blackline disease in English walnut trees.

The discovery, by Srecko M. Mircetich of USDA's Science and Education Administration-Agricultural Research, Davis, could save the annual $200 million walnut industry.

Blackline gets its name because it attacks and kills cells at the union of the rootstock and the scion resulting in a black line girdling the tree at that point. Once the disease is in a walnut tree, the tree may die within three to six years.

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forcing them to grow continuously without rest. This results in stress and increased susceptibility to air pollution. Night lighting also delays fall dormancy exposing late fall growth to frost damage. Death is not a result of night lighting.

Cathey says the trend to more efficient lighting should considerably reduce the stress on trees.

Hollys, rhododendron, linden, and most maples are moderately sensitive to night lighting. Oaks, evergreens and many fruit trees are insensitive. Cathey tested 54 trees and shrubs.

Cathey adds that light is only one of many urban stresses on trees, but that it should be a consideration for selecting plants for brightly lit areas.

HERBICIDES

Banvel herbicides get new registrations

Banvel herbicide and Banvel combinations have recently received several new label registrations from the EPA, announced Velsicol Chemical Corp.

Federal clearances include:

Weedmaster herbicide, a pre-mix combination of 1 lb. dicamba and 3 lb. 2,4-D per gal., is cleared for control of broadleaf weeds in pasture and rangeland grasses and in noncropland areas such as fence rows, roadways, and around farm buildings. Apply when weeds are actively growing at rates ranging from 1 pint to 2 qt. acre.

Benvel herbicide is cleared for control of musk thistle in pastures and noncropland areas at a rate of 1 to 2 pints/acre in 10 to 20 gal. of diluted spray, applied when the musk thistle is actively growing.

Benvel is approved for control of multiflora rose in pastures and noncropland areas at a rate of 1 gal. of Banvel in 99 gal. of water. Use 100 to 200 gal. of solution per acre.

MonDak, a pre-mix combination of dicamba and MCPA, is cleared for grass seed production in Idaho, Oregon, and Washington. Use 1½ pints MonDak on early seeding weeds (4 in. or less in height) after winter dormancy up to the early boot stage of the grass. Applications can be made to lawn-type fescues, perennial ryegrasses, and Kentucky bluegrass.

Continues on page 44

WHY

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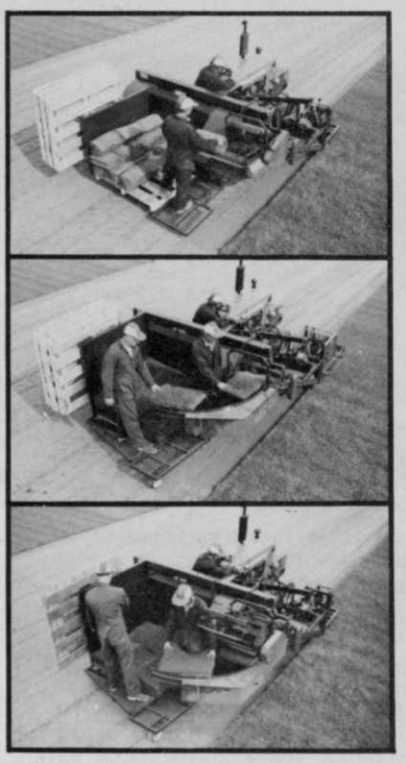

- Rolls, Slabs, or Folds.
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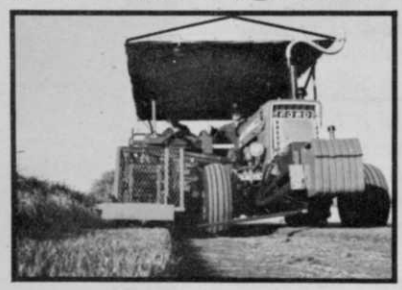
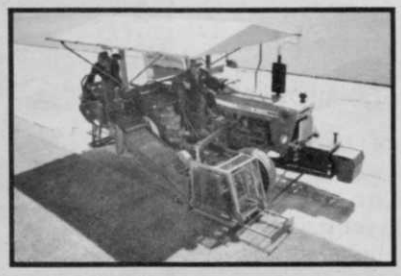


- No waste, cuts to fences, ditches, irrigation pipes.



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SAFE CHAIN SAW USE LINKED TO TECHNIQUE, SIZE

Adapted from a soon-to-be-released audio/visual program by the National Arborist Association, "Chain Saw Safety and Use." This is the latest of eleven audio/visual programs by NAA to aid in training professional arborists.

Although chain saws have made the work of the arborist easier, improper use can result in personal injury. The potential for accidents seems to have increased in direct proportion to chain saws decreasing in weight.

In 1976, chain saws were responsible for 76,000 reported accidents ranging from cut fingers to sudden death. These figures include all chain saw users, from occasional users to professional arborists.

Selecting the proper chain saw for the job at hand is a primary consideration. The weight, horsepower and length of the bar are important factors.

The greater the horsepower and larger the engine, the more the chain saw will weigh.

Large chain saws with long bars are best used for heavy cutting of large wood and in felling operations. Medium-size saws are for light cutting, bucking and limbing. Light-weight saws are used primarily for pruning up in the tree.

Chain saws are almost all driven by two-cycle, gasoline engines which power a sprocket driving the chain around the bar. Some chain saws have direct drive, from engine to sprocket. Others obtain more power by transferring engine power to the chain through a gear box. Other saws are powered by the hydraulic system from an aerial lift device.

Following the manufacturer's recommendations is essential for good maintenance. This is particularly true of the fuel mixture.

The chain and bar must be well lubricated with oil especially designed for this purpose. All chain saws have an oiler device which allows the operator to pump lubricating oil onto the bar while the saw is in operation. Some have automatic oilers. Always be sure that the oil tank is full as the oiler is a safety device as well as a means of preventing excess wear.

Chain saws perform best at high revolutions per minute (RPM). Always be sure that the chain is moving before making contact with the wood. Never overload or cause lugging of the engine.

Peak performance depends upon chain condition. The chain should be properly filed as per the manufacturer's directions. The tension of the chain should never be so tight that it prevents moving of the chain with your hand or so loose that it exposes the drive links on the underside of the guide bar when in the rest position. Never allow the chain to come in contact with sand or dirt as this causes cutting edges to become dull. A sharp chain cuts faster, easier, and more safely.

The bar grooves should be cleaned frequently to remove any buildup of grit, and the bar should be turned from time to time to prevent uneven wear.

When two men are using chain saws at the same time, they should be at least ten feet apart and aware of each other's movements.

The air filter should be cleaned daily, as well as the cooling fins and sprocket. Use mineral spirits, not gasoline, to clean these parts as a safety measure.

All bolts and nuts should be kept tight and the muffler should be inspected frequently for repair or replacement.

The sprocket should be checked for wear weekly. A worn sprocket causes unnecessary wear of the chain. A good rule of thumb is to replace the sprocket every time the chain is replaced.

Trigger throttles, handles, chain brakes, and safety tips are all safety features available for chain saws. To be effective they must be used properly.

When refueling a chain saw, use a funnel or flexible nozzle to avoid spillage on the engine. If there is spillage, the engine should be thoroughly cleaned before starting. Smoking while handling fuel anytime is hazardous. Never refuel a chain saw on grass because any spilled fuel will cause turf damage. It is a good rule to be at least ten feet from the refueling site before restarting the chain saw.

Gasoline should always be kept in a safety gas container. Never use plastic or glass bottles and keep the container in a truck compartment designated specifically for this purpose.

When using a chain saw, personal protective equipment must be worn. This includes work gloves., hard hat, and safety shoes. Eye protection must be worn to guard against flying debris and dust. Ear protection should be worn if there will be prolonged exposure.

A person qualified to give first aid in the event of an accident should be available during use of a chain saw. Qualifications should be a Red Cross, Multi-Media or Bureau of Mines first aid course or equivalent. A physician approved, well-stocked first aid kit should be available also. This kit should be inspected weekly to be sure that it is well-stocked and a record made of each inspection.

In order to handle a chain saw safely, the operator should be well trained. This training should begin with the operator becoming familiar with the information in the saw manufacturer's operations manual as well as the employer's safety manual.

A new employee should observe chain saw operation before being allowed to actually operate one. After observation and complete instruction, the employee can be allowed to operate a chain saw under close supervision.

Only when the employee has demonstrated a thorough knowledge of the saw and its safe operation to the supervisor, should he be allowed to use it unsupervised.

A pre-job briefing by a supervisor or foreman informing crew members of hazards that pertain to that particular job adds to chain saw safety.

A chain saw operator should never work alone and always be conscious of these requirements:

— the space around the area of use should be clear of brush and debris.

— the operator should have secure footing and the chain saw should be firmly supported. Operating a chain saw above shoulder height should be avoided.

— start the engine and operate the chain saw only when all co-workers are clear of the saw. Hold the saw with both hands and allow the saw to warm up before cutting.

— when changing location, the chain saw should be carried with the blade to the rear and with the hot muffler away from the body. Never carry a chain saw on your shoulder or with the chain in motion. If you are moving any distance, or if you let the saw down, stop the engine.

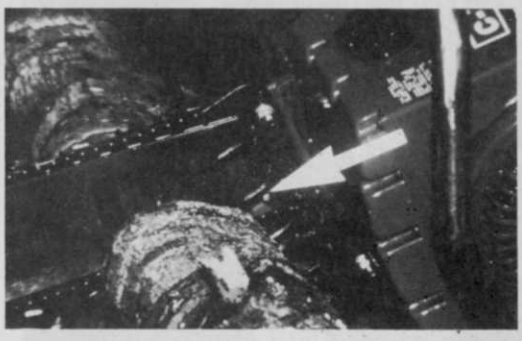
— always be sure that the chain stops rotating around the bar when the throttle control trigger is released.

— proper stance is important for safe operation of a chain saw. The left elbow should be straight with the thumbs on the underside of the handlebar. The body should be entirely to the left of the force and reaction of the chain saw so as to prevent any upward movement of the chain saw from striking the operator's body.

— on steep slopes, the chain saw operator should always stand on the uphill side to prevent logs from rolling into him.

Binding

Binding of the saw occurs during cutting when the weight of the wood being cut causes the wood to close on the chain. This can be avoided during tree removal operations by placing a malleable metal or plastic wedge in the back cut pointing in the intended direction of fall. After the wedge is firmly seated with a sledge hammer, cutting can resume until the tree is ready to fall.

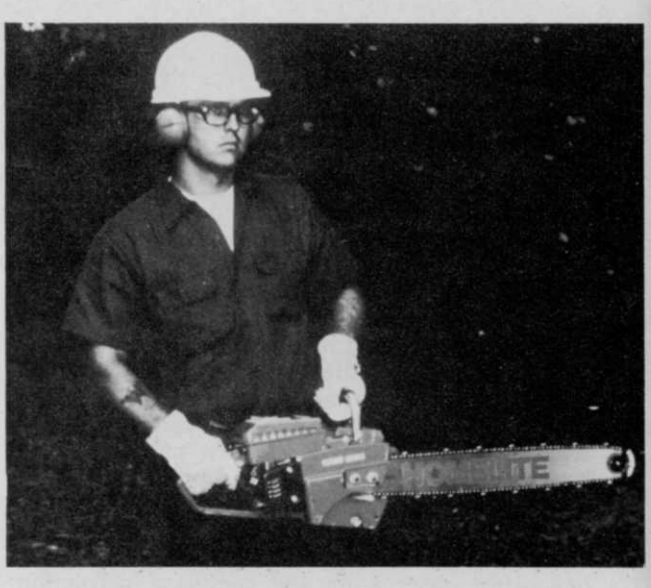


Bucking bar (top) adds leverage to cutting. You should not be able to see the drive links on the underside of the cutting bar with the chain in the rest position if the chain has proper tension. (above, lower)

Bucking is the cutting of large limbs or trunks of felled trees on the ground. Binding can occur here also. To avoid this, undercut one-third of the diameter of the piece and then cut through from the top. Most chain saws are equipped with spikes on front of the engine. This is commonly called a bucking bar and acts as a pivot point to apply leverage for cutting.

When limbing or removing the branches from a felled tree or large limb, leave the large lower limbs to support the log off the ground. Branches under tension are very dangerous and should be cut on the outside of the arc or curve. When a fallen tree is supported by a limb or sapling acting as a spring pole, extreme caution must be used. If possible, roll the log over with a peavey to relieve the pressure. If this is not possible, keep your feet clear and cut the limb close to the trunk and on the outside of the curve. If you cut on the inside of the curve, the saw will bind. If the limb is large enough to hold the log well off the ground, the situation becomes more dangerous and the cutting must be done so that if the log moves, it moves away from the chain saw operator.

Only experienced personnel should use a chain saw aloft in a tree.



Wedge behind saw in cut prevents chain binding (left). Protective clothing (right) includes gloves, hard hat, and eye and ear protection.

Chain saws weighing more than ten lbs. service weight should be attached to a line crotched separately from the operator's and in such fashion so that in the event of the operator releasing the chain saw, it would swing away.

Saws weighing less than ten lbs. can be attached to the operator's belt by a lanyard that would allow the saw to come to rest below the operator's feet in case it fell.

When operating a saw in an aerial lift, it should always be started outside of the basket.

Other NAA Programs

Chain Saw Use and Safety is the latest program constructed and made available by the National Arborist Association. You do not have to be a member to purchase these programs. The cost for each program, which includes a cassette tape of instructions and a tray of slides, is $50 for nonmembers and $25 for members. Besides Chain Saw Use and Safety are:

1. Basic Instruction for Tree Care Trainee
2. Tree Climbing Techniques
3. The Reasons for Pruning
4. Tools and Techniques of Pruning
5. The Reasons for Fertilizing Trees & Shrubs
6. Tools and Techniques of Fertilizing Trees & Shrubs
7. Tree Removal Techniques
8. Technique of Spraying
9. Professional Spraying Operations
10. Technique of Cable Bracing

For further information, contact the National Arborist Association, 3537 Stratford Rd., Wantagh, NY 11793.

Kicking back

Most chain saw accidents are a result of the saw kicking back. This can occur if the chain suddenly hits a solid object or takes too large a cut. The chain stops for an instant transferring the engine torque to the bar and engine. The direction of the reaction depends upon where contact is made along the guide bar.

If the contact is made at the upper part of the bar nose, the reaction will be an upward arc toward the operator. If the contact is on the lower part of the bar nose, the reaction will be a pull away from the operator. In either case, proper hand holds and stance can prevent an accident from kickback.

To give you some idea of the power of a chain saw, the RPMs of a chain saw can drive a chain 24 mph with 1,100 lbs. of thrust with a potential kickback speed seven-and-a-half times faster than the reaction time of a human being.

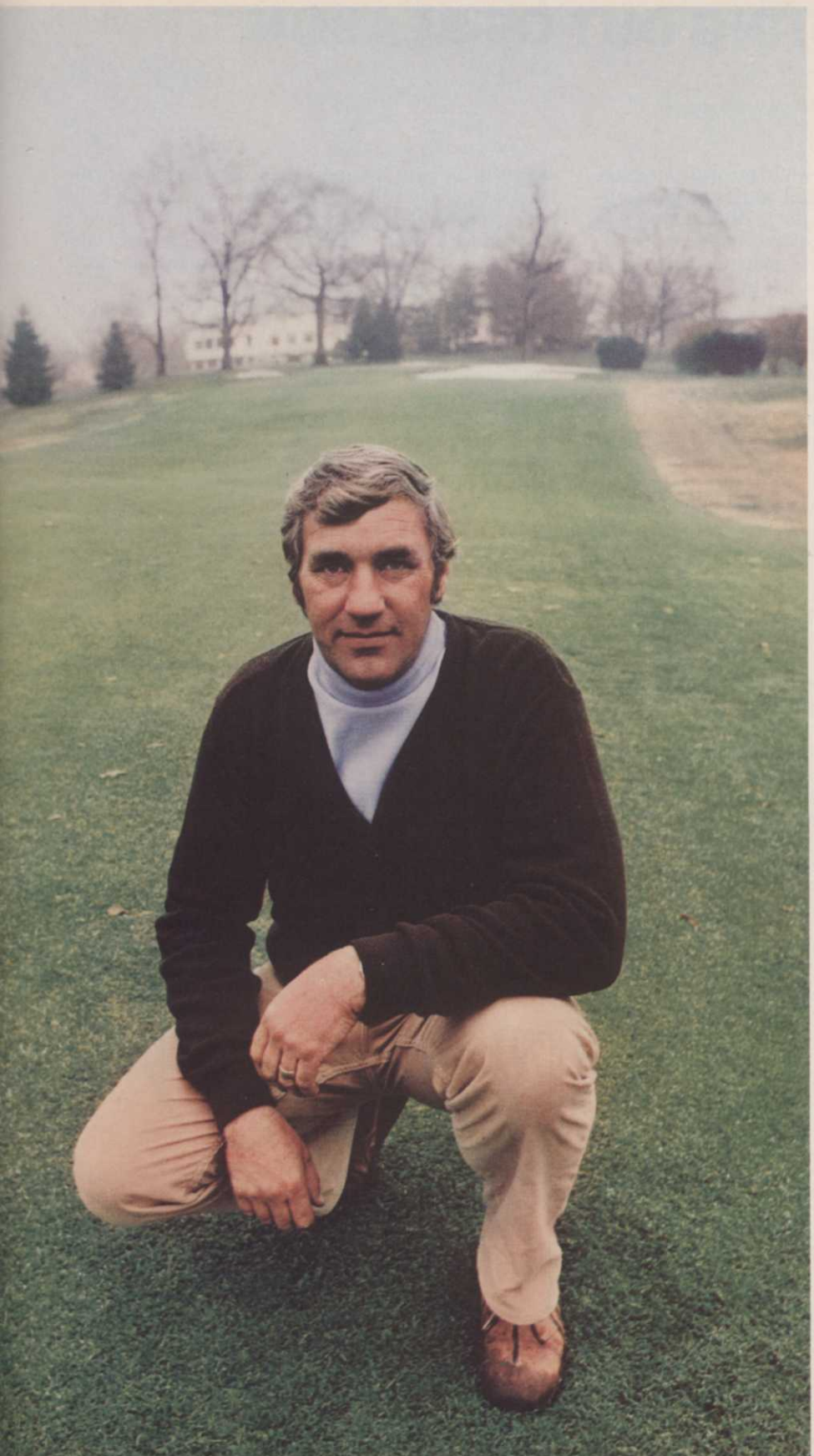
Slicing cuts occur when a chain saw slices through a limb or log unexpectedly striking the operator. Alertness and proper stance can also prevent this.

If two workers are operating chain saws, a minimum distance of ten feet should separate the two. A worker should never approach a chain saw operator until his presence has been acknowledged by the operator.

Keeping a chain saw clean and storing it properly are very important. A chain saw and its fuel should be stored in the lowest compartment on the truck to prevent seepage of fuel onto ropes and supplies.

A chain saw safety program can only cover safety in a general way. Each chain saw operator has a responsibility to himself to function safely and each supervisor or manager has a responsibility to employees to instill a desire to follow safe work practices. Carelessness can and will result in injury. **WTT**

How Roundup® helped Jim Siegfried renovate his fairway in days, without closing it for one minute.



Take a good look at this good-looking fairway.

Last fall, Jim Siegfried found a way to clean it up, without tearing it up—at the height of his club's busy season. With Roundup® herbicide by Monsanto.

Jim is the Greens Superintendent at Losantiville Country Club, Cincinnati, where bermudagrass had become a serious problem on the 18th fairway. To control it, Jim applied Roundup once—while the weeds were still actively growing—right at the start of the Labor Day weekend.

"That's really 'prime time' here," Jim told us. "But after we applied Roundup, we kept the fairway in play the whole weekend, and after. The members played right over it, with no problem."

Since Roundup has no residual soil activity, and won't wash or leach out of treated areas to injure desirable plants, Jim simply took normal precautions against spray drift—and didn't worry about damaging desirable vegetation along the fairway.

Even better, he was able to reseed right into the dying bermudagrass only 7 days after applying Roundup—without loss of playing time or inconvenience to the membership.

Reinfestation won't be a big problem for Jim, either. He knows that Roundup destroyed the rhizomes of the treated weeds, helping prevent their regrowth.

Jim thinks he'll use Roundup again this year—and apparently some club members hope so, too. "As soon as they saw how good this fairway looks, some of the members started asking when I'm going to do the same for #10, where we have some more bermuda. I'll probably tackle that with Roundup this fall."

If controlling many tough emerged weeds and grasses is a problem for you, see your local Monsanto representative or chemical dealer soon for your supply of Roundup.

Roundup. It worked for Jim Siegfried. It can work for you.

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For more information, contact Monsanto Agricultural Products Company, 800 North Lindbergh Blvd., C3NE, St. Louis, Mo. 63166. (314) 694-1000. RE-01D

PRECAUTIONS FOR DIGGING AND TRANSPLANTING OUT OF SEASON

By Maria T. Cinque, Extension Specialist, Nassau County, NY

Spring and fall are typically when most ornamental trees and shrubs are planted and transplanted. Movement of plant materials in the summer is usually not advised because of extremely high temperatures, reduced amounts of moisture and rapid water losses. Yet it is known that professional horticulturists dig, move and plant throughout the summer and with a fairly high degree of success.

What is it that nurseries and landscape crews do to account for the high success rate at this time of the year? Most experienced nursery people who dig and plant trees and shrubs at this time say it is a matter of experience in knowing to do the right thing at the right time.

Not all nurseries will dig plant materials throughout the summer. Some dig until the temperature reaches 80 to 85 degrees F. while others carry on throughout the summer regardless of the temperature.

Some of the tricks of the trade of growers who dig and move trees and shrubs throughout the summer are:

Prior to digging, growers will root prune plant materials in a series of stages. By root pruning or gradually severing the roots, the plant will form a more compacted root ball with many feeder roots.

For large trees, the first step in root pruning is done the season prior to digging. A trench is dug around the tree at the distance of the desired root ball and about two feet deep. By the time the tree is actually dug or broken over, (which is the final stage of root pruning) the severed roots will have developed enough feeder roots to lessen the shock of moving the tree.

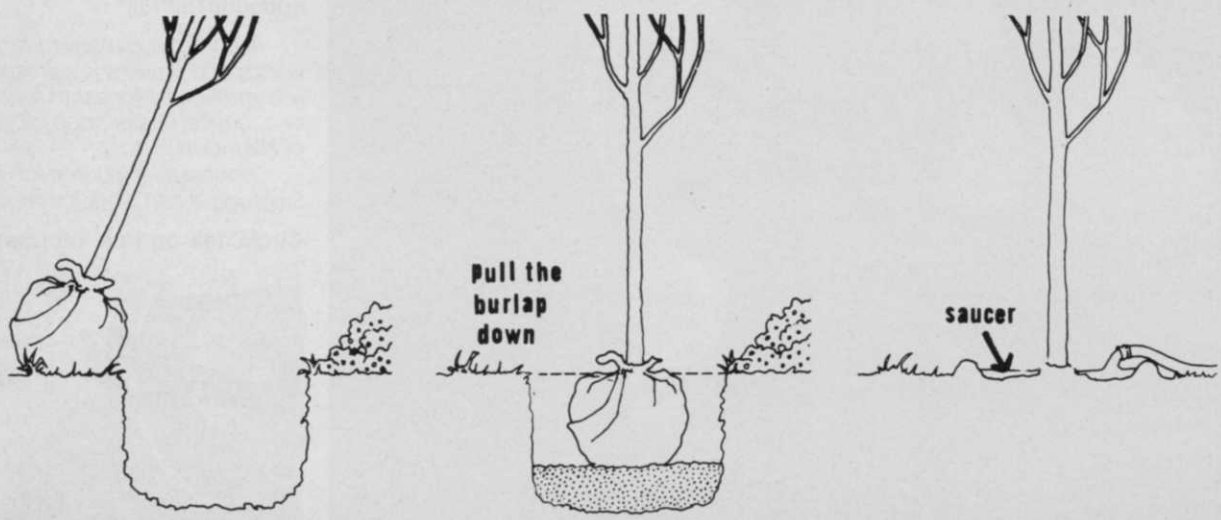
Some growers have indicated that they will wrap and lace the root ball while it is in the hole even though the tap root is still intact. In this case, the soil is kept dry and they are then hand dug while they are still dry. After digging the root balls are immediately saturated and the plants are placed in an area where they are continuously misted during the daylight hours. The plants are kept in this misting area until the new growth hardens off which may be anywhere from three to seven days.

Other growers mechanically dig their materials and prefer the soil to be on the moist side prior to digging. The plants are also placed in a misting area for hardening off. Plants are also hardened off by being placed in the shade for a period of time, without continuous misting, although the root ball is kept moist.

Since most plants are root pruned in the field prior to digging, it is therefore important to **reduce the amount of top growth.** The smaller root system cannot adequately support the same amount of top growth as the pre-pruned roots did. For deciduous materials, it is recommended that as much as one-third of the top growth be removed. Trimmed trees will usually surpass untrimmed trees in size within a two to three-year period. Some nurseries will literally pull the leaves off the trees to help them get through this rough period. Whether the leaves are pulled off or fall off on their own, the trees will break out again, in most cases.

It is best to **dig evergreens once the candles have hardened off,** whether this be in the field or in a misting area, as previously mentioned. It should be known that a way of reducing the top growth of evergreens is to remove the candles. This will eliminate further water losses and help the plant to maintain its turgidity.

Anti-transpirants, which are materials sprayed on the foliage of trees and shrubs, are used by some growers to reduce the rate of transpiration by the



Planting Guides: Hole should be twice the ball width and depth. Six inches of topsoil should be under ball. Backfill with two parts topsoil to one part peat to top of ball and make saucer diameter of hole.

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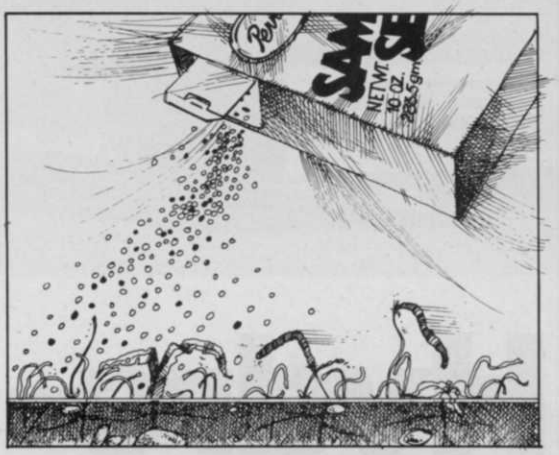

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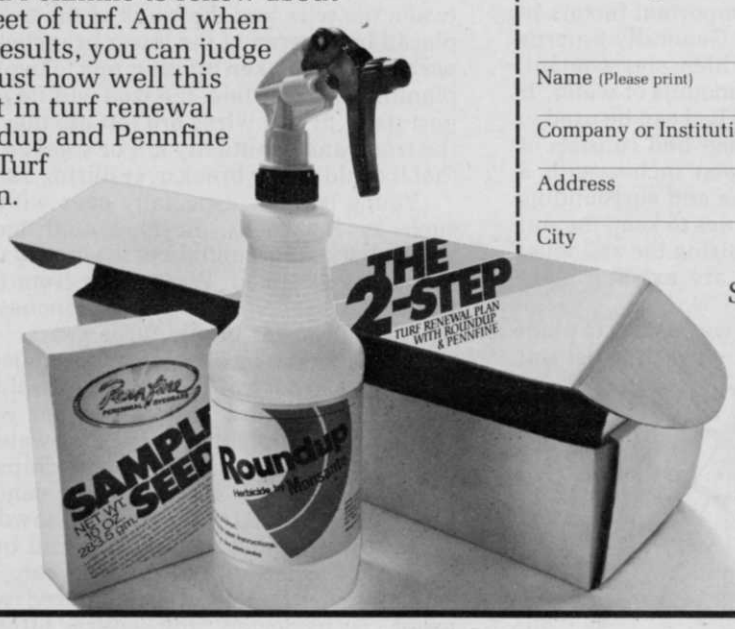

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plant. They are most known for their use in preventing winter injury, but they have successfully been used during transplanting. Some growers indicated that they applied anti-transpirants just prior to digging, while other preferred to make their applications just after removal. Some even indicated that if the material was properly cared for, root pruning, misting, etc., that anti-transpirants were not necessary at all.

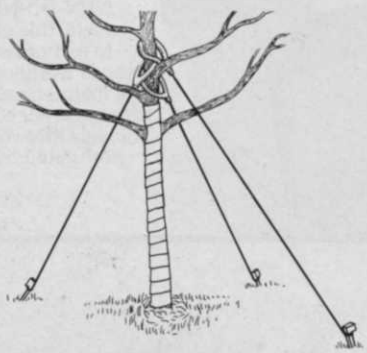
The summer is a very touchy time to move plant materials, especially for long distances. On hot sunny days, it is best to wait until late afternoon or early evening before loading trucks so that they can travel during the night when the temperatures are cool. Depending on the distance, the materials will still arrive in fairly good condition the following morning. It is, of course, unrealistic to expect all shipping to be done overnight, but it helps preserve the plants. In the case of tall trees which will not fit into enclosed trucks, open trucks must be used and the materials covered to prevent further water losses. Whenever possible, refrigerated trailers are used for materials that are transported long distances.

Water is the most critical factor in maintaining plant materials in the retail yard or Garden Center. If the plants are constantly allowed to dry out, their chances of survival are greatly reduced.

As for planting, it is wise to plant the same day or as close to the day of purchase as possible. This means knowing exactly where you or your customer want the trees or shrubs. Unfortunately, most homeowners are unknowledgeable when it comes to caring for nursery stock before it is planted. It has been my experience as an extension horticulturist that the homeowner feels it's okay to sprinkle them lightly with the hose whenever they think of it and that will suffice until they get around to planting them. They can get by with this in the spring or the fall, perhaps, but not in the summer.

Soil type and drainage are important factors in the survival of plant materials. Generally a porus soil is better than one with a high clay content, which tends to hold excessive amounts of water. If the soil has a lot of clay, a raised bed can be used to get around this problem. A raised bed consists of raising the area twelve to fifteen inches with a porus soil mixed with peat moss and surrounding the area with blocks or railroad ties to keep the soil from drifting. This method of raising the soil level should never be used if there are existing plant materials already in the bed.

Another way of dealing with wet soils is to plant trees and/or shrubs which will grow in moist soil conditions. Your Cooperative Extension Agent can help in providing a list of such materials for your area.



Protecting trees
after planting

Fertilizer can be added to the planting hole at the rate of two cupfuls per three foot of hole diameter. A complete fertilizer, higher in phosphate than the other two nutrients, should be used. These trees won't need to be fertilized again until next spring.

If the soil is well-drained, then dig a hole about twice the width and depth of the root ball. Then back fill with six inches of good top soil and place the rootball. Then backfill the hole with a mixture of one part peat to two parts of good top soil until the hole is the same depth as the root ball.

The top of the ball must be level with the ground. Remember to remove the rope or lace and pull down the burlap. If the burlap is not biodegradable remove it. Anything that will not degrade will hinder the plant's growth.

The hole can then be filled three-quarters full and tamped well, being careful not to damage the established soil ball. Then water and finish filling the hole, leaving a saucer type depression around the base of the tree or shrub. This will help to confine the water to the area around the root ball.

During the summer it is extremely important to water each plant immediately after planting. It is difficult to do when an entire area is being planted, but the extra effort will pay off in the long run.

Aftercare is extremely important and the homeowner should be made aware of that. New plantings should be thoroughly watered at least twice a week. For this can make the difference as to how well the material comes through the summer, or if it comes through at all.

Guying is usually recommended for newly planted trees to give them support and to prevent damage from heavy winds. Guy wires are attached to the tree and staked to the ground in three places. A plastic or rubber hose is used as a cushion between the wire and the trunk of the tree. They are placed in the area of the lower branches. This support should be taken off after one to two years after planting. By that time, the tree will be able to support itself. If guy wires are left on, they can girdle the trunk and eventually kill or weaken the tree so that it could easily break over during a storm.

Young trees — especially ones with thin bark, such as dogwoods, beeches and maples, and whose bark is susceptible to drying out or sunscald should be wrapped. Wrap them from the base of the tree to just below the lower branches. The wrap can be left on for one to three years.

Mulching can be a real asset to summer planting since the purpose of mulches are twofold: to conserve soil moisture and to prevent weeds from competing with plant materials for water supplies. Some good mulches are: wood chips, chopped bark, pine needles, small stones, peanut or cocoa hulls, black polyethylene or even sawdust.

All transplanted materials should be observed carefully, especially the first year. Make absolutely sure that they are watered well. If the water is neglected, the entire effort will be wasted. **WTT**

NEED FOR GROWTH REGULATORS ACCENTUATED BY RISING COSTS

R. P. Freeborg, Purdue University, West Lafayette, Indiana

The concept of controlling plant growth with natural plant substances, such as auxins, was first developed in 1926-28 when F. W. Went identified and measured plant growth differences resulting from the application of very minute quantities of these natural plant hormones.

Auxins, as natural plant hormones, were thus able to stimulate plant growth. Eventually purely synthetic compounds were artificially made that could simulate their actions.

From this discovery followed the identification of natural organic substances in plants that could either inhibit or suppress various growth functions in plants. Some of these naturally occurring inhibitory functions we are familiar with include:

1. The maintenance of a dormant state in seeds of many plants until acceptable environmental conditions favorable for growth development.
2. Prevention of premature germination before adequate seed dispersal is attained.
3. Spreading germination over a long period, amounting to years in some cases, to assure the continuity of a species.
4. The ability of plants to compete in a mixed stand is also attributed, in some instances, to the release of an inhibitor by the plant that can prevent the development of other potentially competitive species. One example is that of a wheat-rye stand able to suppress growth of several competitive weeds.

The concept of chemically controlled growth inhibition for specific purposes developed. Initially this became most important as in the development of herbicides for the selective control of undesirable weed species. One of the earliest and most successful of these was the family of phenoxy herbicides of which 2.4-D was the most important. Since this discovery there has been a rapid increase in the introduction and use of plant growth regulators in agriculture, on recreational sites, and in horticulture. The many selective preemergent herbicides are an excellent example of growth inhibitors selectively controlling undesired species.

It is only recently that the concept of growth stimulation to increase crop yields in agriculture and growth regulation or growth suppression in horticultural and turf maintenance have been successfully applied on a large scale.

Increased yields in agriculture are now obtained with the application of synthetic plant hormones that can increase corn production, sugar content in sugar cane, and pineapple yields. It has been stated that the next major breakthrough in food production world wide will be through the use of plant growth regulators. The potential is there and only limited by the imagination.

Since we are now going to discuss growth regulators and their present day application in plant growth, the term should be defined. A growth regulator is a substance used for controlling or modifying plant growth processes without appreciable phytotoxic effect at the dosage applied.

In horticulture we now see the use of growth regulators to control height, as a substitution for cold treatment, for chemical disbudding, to hasten flowering, to produce longer lasting flowers, and for defoliation. (See "Growth Regulators Effective on Floricultural Crops" by R. D. Heins, R. E. Widmer, and H. F. Wilkins, Dept. of Horticultural Science and Landscape Architecture, University of Minnesota, St. Paul, MN for a complete list of compounds and uses). Fruit production is also enhanced by artificial thinning with these compounds. Uniformity of ripening in tomatoes with the use of ethylene has also been successful. There are many other examples to demonstrate the usefulness of these compounds. These early success stories are impressive, yet the industry is only in the early stages of development.

The controlled growth of turfgrass species also demonstrates the practicality of this controlled growth concept. Today with high labor costs and fuel shortages, and the continued increase in fuel costs, the need for effective growth regulators is accentuated. A recent example, for the first time in 1979 the Indiana State Highway Department used a growth regulator when there were no acceptable mowing contracts submitted. In turf growth control, as in other fields, there remains a great potential and need for more effective compounds.

One of the first plant growth regulators sold in the United States was maleic hydrazide (M.H.) introduced in 1950. By 1965 more than three million pounds of growth regulators were sold in the U.S.

Height of unmowed Merion bluegrass next to treated bluegrass four weeks after application.

M.H. accounted for approximately 90%. By 1972 the quantity used increased to six million pounds, with M.H. comprising 70%. By 1975, newer growth regulators were estimated to have accounted for more than 50% of the total market.

There are two primary methods by which growth regulators control plant growth functions.

1. **Terminal growth inhibition.** Some of the effective growth inhibitors now available, including maleic hydrazide, the flurenols, and ethylene releasing compounds act by inhibiting terminal bud growth. These growth inhibiting compounds usually alter geotropic responses, cause axillary bud break or induce early leaf loss, and reduce stem elongation in some plants. Inhibitors such as M.H., the flurenols, and ethylene, that disturb terminal bud growth activity cannot, generally, be used where normal leaf and flower initiation and development are necessary.
2. **Internode elongation inhibition.** These are compounds which inhibit internode elongation without disrupting terminal bud development. Retardants such as CCC (Cycocel®), ancymidol (A-Rest®), etc. are usually recommended to reduce plant height in potted plants, nursery crops and fruit trees since leaf and flower initiation are not severely delayed.

Some of the existing growth regulatory compounds would include:

1. Ancymidol (A-Rest®)
2. CBBP (Phosphon-D®)
3. CCC (Cycocel®)
4. Chlorflurenol (Maintain CF125®), (Po-San®)
5. Mefluidide (Embark®)
6. Ethephon (Ethrel®), (Cepha®), (Florel®)
7. Maleic hydrazide (Slo-Gro®), (Royal Slo-Gro®)
8. Daminozide (Alar-87®), (B-Nine SP®)
9. Gibberellic acids (GA^3, GB^4, $6A^7$)

The choice of inhibitor will depend on the objective. In turf the selection of a compound to control plant height often depends to a great extent on the degree of plant discoloration on thinning that can be tolerated and whether only seedhead prevention is desired. The M.H., flurenols, mefluidide (Embark®) and ethephon can all control excessive plant height. There are situations, however, where high temperatures, excess drought, insect or disease activity can cause turf thinning and discoloration since the turf is unable to recover rapidly due to the growth regulator activity. There are sites where these conditions can be tolerated and where these compounds have a very important place. This would be true for plants viewed from some distance, such as from moving vehicles. Thus the phytotoxic side effects of some compounds can be tolerated.

M.H., the flurenols, and now Embark have successfully reduced the need for mowing grassy areas in the United States and Europe. Reduced blade and sheath elongation are beneficial effects. The reduced length of the seed stalk and reduction of seedhead formation are major factors in the use of these products for roadside maintenance.

For most lawn turf, inhibition of the plant stem and leaf blade elongation is all that is desired. Complete prolonged inhibition of new leaf formation, tillering, rhizome, and root formation is undesirable and will eventually lead to a reduction in turf density as the existing plant parts die and there is not adequate regrowth for recovery.

The M.H., flurenols and Embark, though effective growth regulators, cause a general reduction in quality of good turfs of Kentucky bluegrass, bentgrass, and bermudagrass. This reduction in quality is especially severe under either pest or environmental stress.

Maleic hydrazide at 4 lbs. ai/A restricts stem and leaf growth and inhibits seedhead development. It is best on minimum use turfgrass sites such as roadsides, steep slopes, pond or stream banks, along fence rows and around trees where trimming costs are excessive. Root and rhizome growth may be restricted. Repeat applications, without a turf recovery period, can result in additional thinning.

Flurenols used at 1-3 lbs. ai/A give good shoot growth retardation as well as inhibition of apical bud formation. Leaf color is enhanced. They are most effective when used in combination with the maleic hydrazide.

Embark 2-S at 0.12 to 1 lb. ai/A on cool season grasses and 0.5 lb. to 1 lb. ai/A on the warm season grasses offers good turfgrass growth inhibition and suppression of seedheads. The leaf has a darker green color than that of untreated grasses. There is also some evidence of root growth stimulation. It has some herbicidal activity and therefore can be toxic if rates are not carefully controlled. The compound successfully inhibits fine turf, but here again, under environmental and/or pest incidence stress thinning results.

Another growth regulator that has some potential for the turf market is ethephon. When used at 4-6 lbs. ai/A moderate to good growth inhibition of perennial bluegrass is observed. Green leaf color is enhanced. There is also some evidence of tiller stimulation although with some inhibition of rhizome development. There is an increase in leaf numbers per plant. The leaves are shortened with slightly elongated internodes. This tends to dwarf the plant and thus results in the necessary growth reduction. Therefore, the plant, although dwarfed, continues to grow and offers some protection from environmental stress and pest damage.

The efficacy of these growth regulators can be seen in the data from Purdue 1976 presented in Table 1.

The potential of some existing experimental growth regulators is encouraging. Growth regulators are able to change the bluegrass plant form by shortening the leaf and lengthen the internode, to stimulate rhizome bud formation on perennial bluegrass, and to enhanced tiller formation as rates increase.

The ideal turfgrass growth regulator is one that will reduce leaf and stem height and produce many small leaves to maintain surface density and

Continues on page 30

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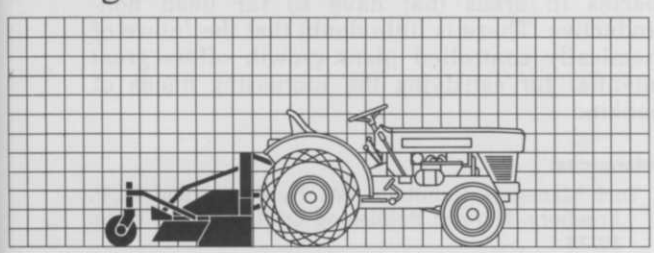

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Growth Regulators *from page 26*

Table 1. Reduction in Kentucky Bluegrass Growth

	ai/A lbs.	Growth Reduction 20 days	49 days	89 days	Effects on plant
		%	%	%	
Control	—	normal	normal	normal	—
Ethephon	6	50	54	32	darker green
M. H.	4	50	73	22	slight chlorosis
Embark	0.5	56	65	33	darker green
Sustar	4	61	35	23	darker green

color and permit continued growth or stimulation of tiller, rhizome and root formation, thus reducing mowing requirements yet maintaining the plant in a vigorous growth state to enable it to overcome the environmental or pest incidence stresses.

Application of growth inhibitors may be as foliar sprays, fogs, and as soil drenches. Inhibitors such as M.H. flurenols, Embark, and ethephon are generally applied as foliage sprays. Adequate moisture is essential at application to assure proper entry into the plant.

M.H. and the flurenols have been applied as a soil drench to effectively reduce shoot growth. Some of the phytotoxic side effects of foliar applied M.H. are minimized by soil applications. However, labels should be checked for rates and application procedures. Soil applications to shrubs and other ornamentals for growth retardation have not been successful due to rooting depths of the plants.

The effectiveness of foliar sprays may be increased by reducing the average droplet size and using more concentrated solutions. Fogging applications may be useful for foliar applied compounds, especially in enclosed or isolated areas where drift is not a problem. The finer mist offers greater potential for chemical effectiveness because both the upper and lower leaf surfaces are covered offering greater potential for plant uptake.

Adjuvants which aid in surface wetting and thus absorption of the active ingredient can be combined with growth regulators. There is general agreement that the action of surfactants in improving foliar absorption is complex involving more than the increase in surface wetting. M. H. has recently been formulated with a special surfactant (Royal Slo-Gro formulation) that further enhances the activity on a limited number of species. Foliar absorption of M.H. is reduced after the droplet has dried.

Test plots show seedhead suppression and growth retardation six weeks after treatment to Kentucky bluegrass. Photo courtesy J. A. Jagschitz, Virginia Polytechnic Institute.

Cumulative phytotoxicity caused by applications of growth regulators has not generally been reported. M.H., flurenols, Embark, and ethephon however, appear to have a residual effect on some species.

Solutions of 0.3 to 0.4% M.H. are normally applied annually to tops of trees under power lines. M.H. is applied only to trees in which bud break and leaf growth were normal the previous spring. For this reason, cumulative phytotoxicity has not been observed. Some regrowth is necessary before growth regulator applications are repeated.

As yet there is no method of predicting sensitivity of a species to a compound. One species may respond to a compound when another does not. This may be due, in part, to differences in absorption, transport or metabolism of the compound.

Finally, the growth regulators available to date, though effective, have some limitations. These may be due either to phytotoxicity, thinning, excess or inadequate inhibition, or due to short or a prolonged residual inhibition period. Continued investigations will produce newer compounds that will permit the chemical manipulation of plant growth in specific directions. There is no reason why drought resistance and winter hardiness, rhizome, tiller and root formation with vertical leaf growth suppression should not be obtained by chemical treatment, thus permitting the agriculturalist to modify plant growth to meet local conditions or needs, and expand and introduce plant species in areas that have so far been nonproductive. There is little doubt that the future of chemically controlled plant growth offers great potential for satisfying the increasing needs of mankind.

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PENN STATE TESTS REVEAL GROWTH REGULATOR PROS AND CONS

by Thomas L. Watschke, Associate Professor of Turfgrass Science, The Pennsylvania State University

Commercial and experimental growth retardants have been tested for seven years on different cool season turfgrasses at Penn State. The principal objective has been to reduce foliar growth without reducing aesthetic quality. Also, research has been conducted using growth retardants to control annual bluegrass *(Poa annua* L.) through seedhead inhibition and postemergence phytotoxicity to seedlings.

Retardation of fine turfgrasses

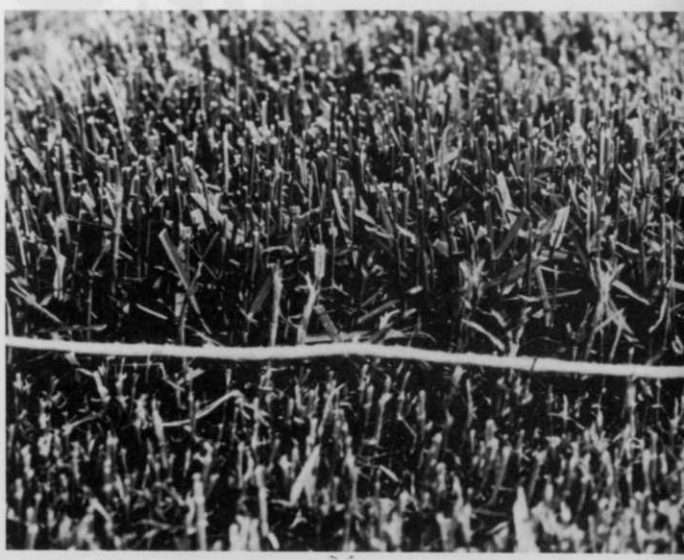
During the past seven years, Kentucky bluegrasses *(Poa pratensis* L.) and, in some years, tall fescue *(Festuca arundinacea* Schreb.) have been treated with several different growth retardants. Among those tested have been MH, Chlorflurenol (CF-125), MBR 6033 (Sustar), MBR 12325 (Embark), Endothal, C-19490, CGA-17020, CGA-24705, RO7-6145, EL-509, EL-72500, MBR 13387, DS-31247, DS-35245, and PP-333. Treatments have been applied as granular and liquid formulations (at 50-200 gallons of water per acre). Initial applications have been applied in late April or May with repeat applications applied four to six weeks later (depending on material).

Color ratings have traditionally been taken on a weekly basis following treatment. Yields have been taken weekly in some tests and at longer intervals in others. Height measurements have been taken at regular intervals on all tests. Seedhead suppression has been recorded when applicable and density measurements have been taken at the end of most tests. Carbohydrate levels were sampled twice monthly in one experiment in 1973.

Results of studies

Typically, all materials retarded top growth (more from higher rates than lower) for approximately four to six weeks. Duration and intensity of injury varied from chemical to chemical. Severe, long lasting injury has been the exception rather than the rule for most experimental materials. Initial studies used MH and Chlorflurenol as commercial standards, however, Embark has been used as a standard in recent years because it has become commercially available, causes less injury and more growth suppression than MH. Typically, tall fescue has been injured less than bluegrass by most materials. Duration of growth suppression for a particular chemical has been approximately the same for tall fescue and bluegrass.

Without exception, after the retardation effect has subsided, treated turf has tended to grow faster than untreated turf. This "flush" of growth usually lasted for two or three mowings. Reapplication of growth retardants has been attempted to maintain the turf in a suppressed state and reduce the growth flush. Reapplication rates have typically been one-half the initial rate to minimize injury



Some growth regulators make grass stemmy and leaf growth further above ground. Note grass in background mowed after treatment ended. Grass in foreground cut too low also has stemmy appearance. Photo courtesy J. A. Jagschitz, Virginia Polytechnic Institute.

(which is usually more severe during high temperatures). However, lowered reapplication rates have not retarded growth nearly as long as the initial treatment even though injury was reduced.

Soluble nitrogen fertilizer (urea) has also been applied to turf treated with growth retardants to reduce injury. It was found that injury was reduced, but the duration of retardation was shortened and the growth stimulation following growth suppression was increased.

Some slight decreases in bluegrass density have occurred due to treatment with growth retardants. This phenomenon has even been found the year following treatment in some cases. Tall fescue density has not been reduced as much as bluegrass.

Granular formulations of most materials tested have significantly reduced injury while maintaining four to six weeks activity. Recently, root absorption of granular experimental materials has allowed applications that do not require foliar absorption. The result has been less injury. Root absorption offers advantages and disadvantages. Obviously, reduced injury is an advantage, but another would be the potential for slow release formulations that could bring about season long growth suppression. A possible drawback would be the necessity for water to release the chemical. However, irrigation systems are typically available to supplement rainfall in most turf situations.

Increased disease susceptibility has been reported on grasses treated with growth retardants. Dollar spot, leaf spot, and stripe smut are the three

diseases most frequently observed. Treated turf does not have the capability to mask disease blighted leaves with new growth. Recovery from severe disease attacks is also slower. Disease susceptibility has also been shown to carry over from one year to the next. This has been particularly true for leaf spot and stripe smut on bluegrasses. This phenomenon has only been observed when more than one application of a given growth regulator has been made the previous year. In the future, long residual or controlled release materials may have even more potential for increasing disease problems the following season. However, fungicides applied to turf that has been treated with growth retardants have reduced diseases to the same degree as fungicides on untreated turf.

Although considerable progress has been made, commercially available growth retardants should not be applied to turf that has a high aesthetic priority. For now, hazardous-to-mow, non-use, and trim areas have the greatest potential for growth retardant use. Areas where aesthetic quality is not at a premium also offer possible uses. In a test where Embark has been applied to tall fescue between the tree rows of a trellised apple orchard (where some discoloration can be tolerated), the number of mowings has been significantly reduced without detrimental effects to the apple trees. Three years of applications in this orchard did not reduce the quality of the tall fescue stand. The future for growth retardants on fine turf is uncertain, but experimental materials currently under test have shown considerable promise. Long residual, non-injuring growth retardants may become available for turf before management programs are designed to incorporate their use.

With fossil fuel and water shortages already upon us and the prospects for the future being the same, reduced turf growth can contribute to the solution of both problems. Gas and oil dependent mowing equipment will be used less and water will be conserved because of a slower growth rate.

Growth retardants for annual bluegrass control

Before 1970, most annual bluegrass control work dealt with determining the proper proportions of the growth retardants, chlorflurenol and maleic hydrazide (MH) to inhibit seedheads. By 1973 it was concluded that chlorflurenol (0.5 lb/A plus MH at 1.0 lbs/A) was sufficient to suppress seedheads. Multiple spring applications resulted in better seedhead inhibition than single treatments and the inhibition lasted longer. Repeat applications were made at one half the initial rate to reduce injury.

Soil under turf treated with chlorflurenol + MH was found to have a significantly reduced amount

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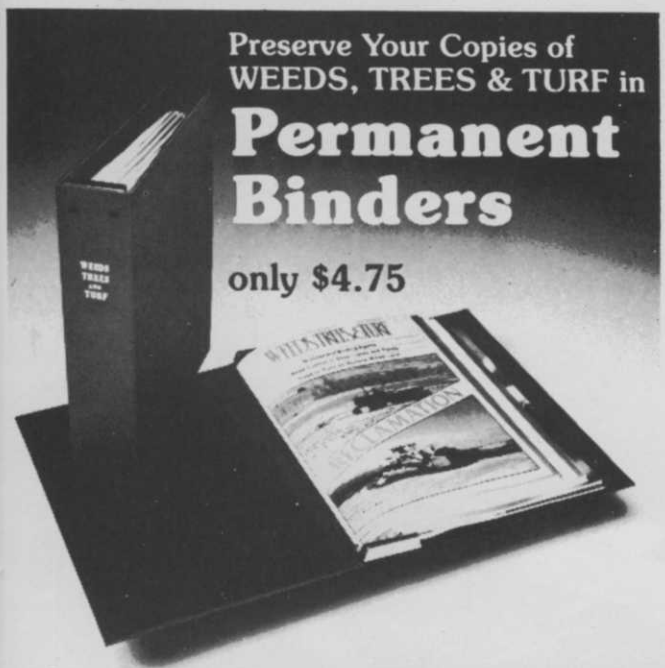

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of seed shattered onto the soil, but the amount of seed found was still sufficient to allow the stand to be self-perpetuating. In addition, these growth retardants were not found to significantly effect the viability of the seed produced by treated plants.

Fall application

In 1971, late September applications of chlorflurenol (0.5 lb/A) plus MH (1.0 lb/A) produced encouraging results. A significant number of annual bluegrass seedlings were controlled and, with the onset of cold weather, there was a reduction of mature annual bluegrass. During winter, the treated turf was severely discolored, but, the following spring the desired species had a normal "green-up". There was also a significant decrease in seedhead production by the surviving annual bluegrass. Spray dilutions of 70 gallons/acre were necessary to insure adequate distribution of the chemicals to the seedlings, because many were under the mature leaf canopy.

When annual bluegrass comprised 30% of the turf population or less, overseeding was not necessary. Voids were rapidly filled in by the desired species or sometimes by germinating annual bluegrass. When more than 30% of the stand was annual bluegrass, overseeding after treatment worked best. Chlorflurenol and MH have no preemergence properties, therefore a delay before overseeding was unnecessary. Due to the lateness of chemical treatment (late September or early October), spring overseeding should be considered, particularly when Kentucky bluegrass is used. A groover-type seeder should be used to insure good seed to soil contact regardless of overseeding time or species.

Recently, MH applied alone in the fall (1.5 lbs/A) has controlled annual bluegrass nearly the same as when combined with chlorflurenol. In tests with chlorflurenol, MH alone controlled annual bluegrass about the same as the combination, while chlorflurenol alone was not effective. The advantage of the combination appeared to be in the knotweed and clover control that resulted. MH alone did not provide good broadleaf weed control.

In experiments on bentgrass-annual bluegrass fairways, MH (1.5 lbs/A) has controlled annual bluegrass significantly. Discoloration of bentgrass was more severe than on Kentucky bluegrass during the winter months and spring "green-up" was a little slower. When the percentage of annual bluegrass in bentgrass fairways was high, a two directional overseeding, (bentgrass one way and

Continues on page 54

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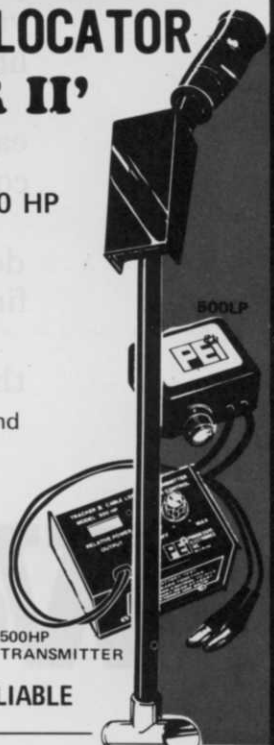

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Sure, there's more to maintaining quality, disease-free turfgrass than a couple of fertilizer applications. But turfgrass scientists across the country are reporting that a fall application of IBDU (31-0-0) can produce turfgrass with better root development and less disease problems.

Dormant turfgrass plants continue to produce rhizomes and roots, even though vertical growth has stopped. During this time nitrogen should be made available to the turfgrass plant as carbohydrates are naturally accumulating. Thus, scientists say, the optimum timing for nitrogen applications is during the fall and early winter months.

IBDU (31-0-0) is ideally suited for dormant nitrogen fertilization. Because of it's slow release characteristics based on hydrolysis, IBDU releases nitrogen later in the fall and earlier in the spring promoting better rhizome and root growth. A fall fertilizer program using IBDU should produce healthier more vigorous turfgrass plants and reduce the severity of several turfgrass diseases.

Remember. Healthy turf next spring starts with IBDU this fall.

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RINGS AND PISTONS INDICATE ENGINE MAINTENANCE NEEDS

By Paul Scholten, Service Manager, Kohler Co.

In the July issue, we talked about analyzing the air intake system, oil, carburetor, and valves as you tear down your four-cycle engines. By carefully noting what you find, you can better understand what steps you must take to prevent engine problems in the future.

Now we come to the rings and the pistons. Here you should remember that almost all ring and piston failures are related to either excessive wear or seizure.

If during teardown you find that a piston has cracked, check for wear patterns on the side of the piston, excessive wear on the rings, and wear patterns in the cylinder bore. Such wear can cause piston slap which leads to cracking in the piston skirt.

In some instances, wear may be caused by dirt that entered through the air intake or by a build-up of carbon. You can tell this by examining the top ring and the area above it. If the top ring and the area above it are excessively worn but there are signs of decreasing wear on down to the oil ring it is likely that dirt or carbon contamination was the culprit.

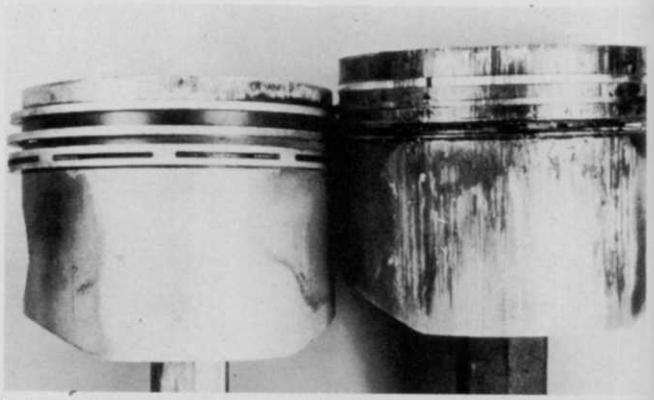
Piston seizure is most commonly caused by overheating resulting from a lack of cooling air. It can also be caused by poor lubrication, oil additives, foreign matter in the oil, and gum deposits from stale gasoline. Since all of the causes leave similar types of damage, it is very difficult to single out the culprit by examining the affected parts. But, if you have carefully noted the condition of the oil and cooling system when you began the teardown, you can probably figure out the cause of the seizure.

It used to be assumed that the discoloration of a rod indicated a failure caused by lack of lubrication. Recent studies show, however, that such discoloration may have many causes.

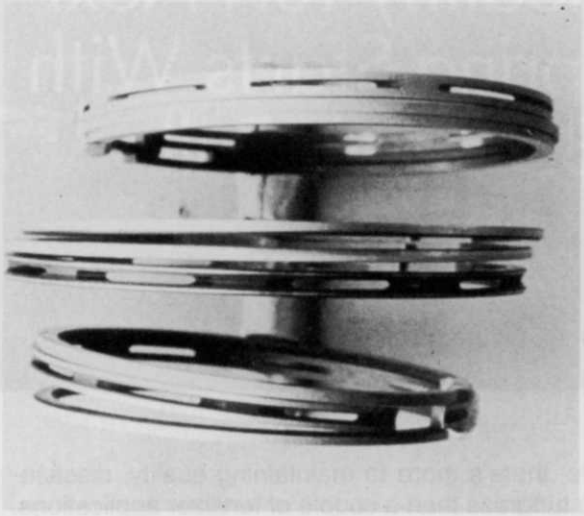
You can analyze a rod failure by checking four areas. First, inspect the dipper. Has it been broken off? Note its color compared to the rest of the rod. If there is a color difference between the top of the rod and the bottom it indicates that there was oil in the crankcase. If the dipper is broken and the color on both sides of the break is the same, that would indicate that the break occurred after the seizure. If the rod is the same color from one end to the other, it indicates that there was no cooling and that the entire rod ran extremely hot.

If the dipper is missing, check the surface of the break for clues to the cause of the breakage. Burned oil on the break surface indicates that the dipper broke before the seizure. An oil-free break tells you that the break occurred after the seizure.

Next examine the rod bearing surfaces. Look for the presence of deposits as indicators of specific conditions. For example, carbonized oil deposits on the bearing surface show that there was oil present so a lack of oil is unlikely to be the cause of the engine failure. If no such deposits exist, there was no oil present when the failure occurred and that has to be considered as a possible cause of the engine trouble. Partial scoring of the surface of the bearing shows that there was an incorrect fit between the rod and the crankshaft.



Pistons show excessive wear (left) and seizure (right). Wear can be a result of dirt coming in the air intake or carbon buildup. Seizure is usually caused by inadequate colling or poor lubrication.



Oil rings tend to wear faster and get wider as wear takes place.

The third area to be examined is the surface between the cap and the rod. Improper fit here is usually the result of incorrect tightening or incorrect torque. You should be able to see signs of this on the mating surfaces as well as on the rod bolts.

Rough mating surfaces may prevent correct fit between the rod and the crankshaft even though proper torque is applied. That will cause an un-

Continues on page 47

Jack of all trades–master of most

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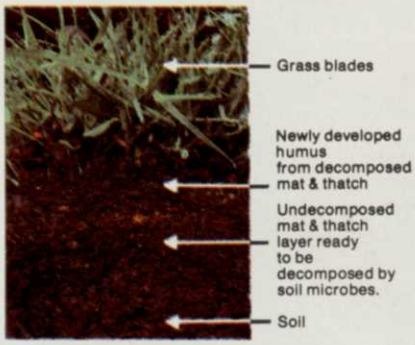
BEFORE

At time live soil bacterial spores were applied — note the accumulation of compacted Mat & Thatch at the surface. Heavy thatch sheds water, harbors insects and disease, and prevents deep root growth.

HOW THE PROCESS WORKS


Grass blades
Newly developed humus from decomposed mat & thatch
Undecomposed mat & thatch layer ready to be decomposed by soil microbes.
Soil

NOTE: Decomposition progresses from the top surface of mat & thatch downward into the soil because the microorganisms have been applied to the surface. Approximately 6 billion microbes are applied to 1,000 sq. ft. of lawn. Under ideal conditions they will double their numbers every 20 minutes.

AFTER

15 weeks later — same lawn — note that the Mat & Thatch has almost completely disappeared, roots are deeper, and the soil is looser and in better physical condition due to bacterial decomposition.

INTRODUCTORY OFFER

Now, for the first time, a complete, natural product is available that contains natural organisms along with a completely balanced diet that will:

1. Naturally decompose mat & thatch up to ¾" within 9 to 12 weeks
2. Create more ideal conditions for the natural soil organisms to grow and multiply so they can continue their decomposition of Organic Matter, and at the same time, build up the productive capacity of the soil.
3. Reduces the stress conditions that produce insects and diseases, and provides a complete, balanced diet for the natural growth of desirable turf.
4. Reduces the need for: Frequent fertilizing
   Frequent watering
   Frequent applications of pesticides (fungicides & insecticides)
5. Eliminates the need for: Power Raking
   Frequent reseeding & resodding
6. Loosens, aerifys and builds more productive soil naturally, along with beautiful, healthy plants.

All you need to do is to mix the ingredient into your power spray rig, spray uniformly over your lawn — one application this season will decompose ½" to ¾" of Mat & Thatch, when used as directed.

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The mat thatch is _____ inches deep

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VEGETATION MANAGEMENT

By Roger Funk, Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *What is the latest information on Dutch elm disease control?*

A: Two research projects which involve the use of sex pheromones as an attractant to the elm bark beetle are currently underway.

Hundreds of sticky traps in conjunction with sex pheromones have been placed in a number of cities and have trapped literally millions of beetles. Unfortunately, the data has not shown a significant reduction in the occurrence of Dutch elm disease in the test areas. Dr. Lanier (Syracuse University) has demonstrated that, with isolated small "islands" of elms, trapping is successful, and he is recommending that sex pheromone traps receive a label for elm bark beetle control.

Sex pheromones are also being used experimentally to attract elm bark beetles to selected trees infected with Dutch elm disease. The trees are then injected with cacodylic acid which kills the trees, resulting in the death of the beetles. At the present time there is insufficient data to determine the effectiveness of this technique.

Our total control program has not changed in recent years and includes sanitation (pruning), dormant bark beetle sprays with methoxychlor, the injection of either of the fungicides Arbotect or Lignasan, prevention of root graft transmission of the fungus, and fertilization.

Q: *Will sod reroot after white grub damage?*

A: Grub injury can be compared to laying new sod. If the area is watered properly, new roots are formed and the turf "knits." Other cultural practices which minimize stress such as a higher mowing height, light fertilization and the avoidance of herbicides during this period will increase the chances for recovery.

Q: *I recently read that the Europeans have solved the chestnut blight problem. Are we doing anything here in the United States?*

A: Hypovirulent (less virulent) strains of the fungus *Endothia parasitica* which causes chestnut blight have been found occurring naturally in Italy. These hypovirulent strains are apparently infected with a virus, mycoplasm or similar organism that results in the loss of the ability to cause the chestnut blight disease. Fortunately, this hypovirulent factor can be transferred to the virulent strain which then becomes hypovirulent. In other words, the chestnut blight organism itself becomes diseased.

In Europe, the hypovirulent strains are disseminated naturally, providing a relatively inexpensive and practical means of control. Unfortunately, hypovirulent strains are not disseminated naturally in the United States, and each canker must be individually treated. Although usually effective, this method is time-consuming and not practical for widespread control of chestnut blight. The general feeling of scientists working on this problem is that the use of hypovirulent strains will eventually be successful in the United States.

Q: *There seems to be much controversy among some lawn maintenance firms, regarding liquid fertilization as opposed to granular fertilization. Could you please address this subject? I realize there are many points to consider; if this question seems too broad, could you suggest reference material that would cover this topic?*

A: All fertilizers — regardless of the source — must first dissolve in water before they can be absorbed and utilized by plants. Liquid fertilizers are already in a form that can be absorbed when they are applied; granular fertilizers dissolve in soil water to form the same nutrient salts (ions), found in liquid fertilizers.

Dry fertilizer programs can offer slow-release nitrogen by applying organic sources which must be broken down by microorganisms in the soil before the nutrients dissolve, or by applying nitrogen sources coated with a substance that slows down the process of dissolution.

Liquid fertilizer programs can offer the same slow-release properties by applying organic nitrogen as liquid ureaform or as a very fine powder that will remain in suspension.

Some slow-release nitrogen is desirable to produce more uniform growth and to reduce the "burn" potential during the hot summer months. Of course, the more often fertilizer is applied, the less need there is for slow-release properties.

Since the turfgrass plant absorbs fertilizers in soluble form regardless of the form in which they are applied, the real question is not whether the program is liquid or dry but whether the fertilizers are applied properly.

For more detailed information, I am sending to you a copy of a Davey publication entitled "Introduction to Fertilizer."

Q: *We have problems with rhododendrons in the West Virginia area. What food should be used?*

A: Rhododendrons grow best when the soil pH is between 5 and 6. You should test your soil pH and correct it if necessary since alkaline soils result in inefficient utilization of nutrients, particularly iron. Fertilizer formulated for the so-called acid-loving plants or well-rotted manure give good results with rhododendrons.

You might also check for *Phytophthora* root rot which is common in some parts of West Virginia and is often misdiagnosed as a nutrient deficiency. The new leaves initially are a dull yellow color and later turn cinnamon brown and collapse like a closed umbrella. **WTT**

ARBOTECT® 20-S
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ARBOTECT 20-S fungicide helps make it possible to save many elm trees that otherwise would be lost.

Injected into the trunk of the tree, ARBOTECT builds a barrier against Dutch elm disease inside the tree itself. It helps prevent the disease in healthy elms, and can often save infected trees if they are treated early enough.

Used along with sanitation, insect control, and root graft elimination, ARBOTECT can significantly improve the effectiveness of a Dutch elm disease control program.

ARBOTECT differs from other elm fungicides in several important ways:

- It is registered at rates high enough to be effective.
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PROSCAPE

By Michael Hurdzan, Ph.D., golf course designer and consultant

Q: *How do you locate buried plastic tile and water lines without disturbing large areas of turf? J.M.F., Wickford*

A: Whenever a tile or piping system is planned it should be drawn out on a topographic map with as much detail and accuracy as possible. This plan should then be followed as closely as one can during installation. But if the area being planned is 150 or 200 acres, by necessity the scale of the plan must be 1 inch = 200 feet or 1 inch = 100 feet. At these scales, the width of a pencil line might be equivalent to 5'-10' on the ground.

So the drawn plan should be carefully followed but adjusted in the field as necessary to make the system most functional. If these field changes are significant then these changes should be carefully noted on the original plan. After the project is complete, the plan should be redrawn with all the changes incorporated and this becomes a "drawing of record." From this drawing of record one can quickly see the relative location of the field installation. However even with a detailed record drawing finding the actual installed tile or pipe in the field can sometimes be very costly, aggravating, and laborious.

To reduce the problems of finding the buried conduit several things can be done during installation. One procedure would be to measure the exact distance of the trench from some known landmark such as a large tree, a fence, or building, and note this on the drawing. Another procedure would be to install gravel or sand to the soil surface at every tile intersection or at every major change in direction of the pipe or tile. Not only will this gravel backfill permit you to more easily find the intersections but they also can serve as gravel drop-inlets for surface water. A third method is to drive steel pins into the soil to just below the soil surface at important reference points so these points can again be found using a metal detector.

Once a tile has been uncovered and you wish to check it's function, there is another simple procedure that may aid you. Find the outlet end of the tile that you think is plugged or broken, or uncover the tile in several places along its length about 100 yards apart, and start running a small stream of water into the tile if it is not already flowing any water. To either trace the flow of this water or to find a stoppage, use food coloring to color the water and simply look for the marked water. If no colored water comes from the outlet or does not reach the next observation spot down the tile run then you know that you have "bracketted" the disfunction. Repeat the procedure with narrower brackets until you find the problem. **WTT**

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News *from page 14*

NURSERY

Garden suppliers to gather in Germany

The business year has commenced surprisingly well in all sectors of the garden supplies industry, according to information officers of the International Garden Trade Fair to be held in Cologne, Germany.

The officers report that manufacturers expect a growing development of sales in months to come in view of the continuing brisk demand. Additional business may be generated from the 7th International Garden Trade Fair scheduled for the Cologne trade fair centre from September 23-25.

Thus far, 413 direct exhibitors and 39 represented firms from 18 nations have applied for space at the fair. Of these, 167 direct exhibitors and 21 represented firms come from countries other than Germany.

Foreign participation is headed by Great Britain with 53 direct exhibitors and another 3 represented firms to date, followed by France (20 + 2), Holland (20 + 1), the United States (15 + 5), and Italy (14 + 3). The proportion of foreign countries represented will be about 44 percent.

The wide range of products exhibited includes lawn mowers, garden implements and tools, garden equipment, and garden supplies. They should fill a floor space of 344,-320 square feet.

HORTICULTURE

Prominent speakers head horticulture show

Ted Stamen of the University of California and Tom Flippen of John Henry Co.'s Floral Decor Div. will highlight the Living Plant Growers

Continues on page 46

THE SUPER TOOLS FOR MAINTENANCE PRUNING

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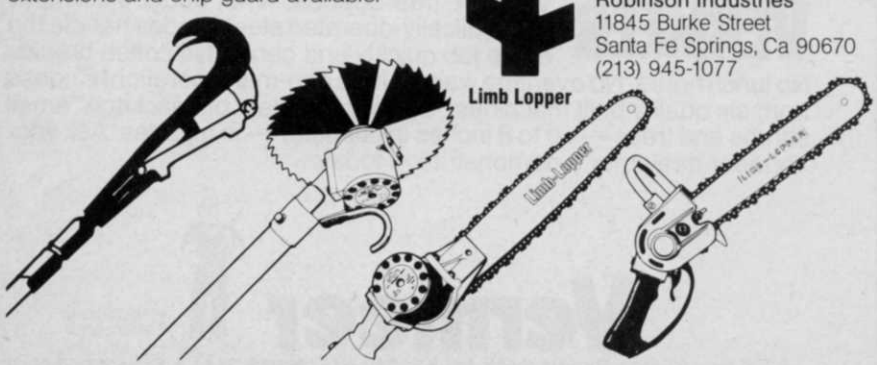

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THE LABOR SAVER

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News *from page 44*

Association seminar at the Pacific Horticultural Trade Show in Long Beach, Calif.

The LPGA seminar is one of three scheduled for Friday morning of the three-day event, September 6-8 at the Long Beach Convention Center and sponsored by the California Association of Nurserymen.

"Marketing and Merchandising House Plants — an Overview" will be Stamen's subject. He has much experience as a horticulturist with the University of California Cooperative Extension.

Flippen, an experienced nurseryman and Western Sales Manager for the John Henry Co., will speak on "Merchandising House Plants in the Retail Industry."

A general session seminar will run concurrently with the LPGA seminar from 10 a.m. until 12 noon. It will feature Charles D. Greenidge, Ph.D., a management consultant, and a discussion of problems of landscape maintenance by a panel of experts for the California Landscape Contractors Association seminar.

NURSERY

Allied trade show set for Tampa, Fla.

The 1979 Florida Nursery & Allied Trades Show will be held at the Florida State Fair Expohall in Tampa, Fla., Sept. 28-30.

The Expohall is located within the 276-acre Florida State Fair and Expopark. The facility features 93,000 square feet of unobstructed and air conditioned floor space and a 45-foot ceiling.

Concession areas are located within the building and parking is readily accessible with space for 10,000 cars within walking distance of the Expohall.

The show is being co-sponsored by the Florida Nurserymen and Growers Association and the Florida Seedsmen and Garden Supply Association.

TREES

Survey yields tree farm data

Growing sawtimber or pulpwood is the primary objective in tree farming for 79 percent of those responding to a questionnaire given by Tree Farm News.

Out of more than 5,000 tree farmers who completed the questionnaire, 36 percent, the largest segment, indicate that they originally began to practice forest management because of a general interest in forestry.

Data on the respondents shows that 77 percent own tree farms with less than 200 acres and 61 percent have their principal residence on their tree farm, or live in the same county.

Other personal questions revealed that 53 percent have a college or graduate degree. Fifty-six percent report incomes exceeding $20,000.

More than half of those surveyed say they would be interested in visiting other outstanding tree farms in their region.

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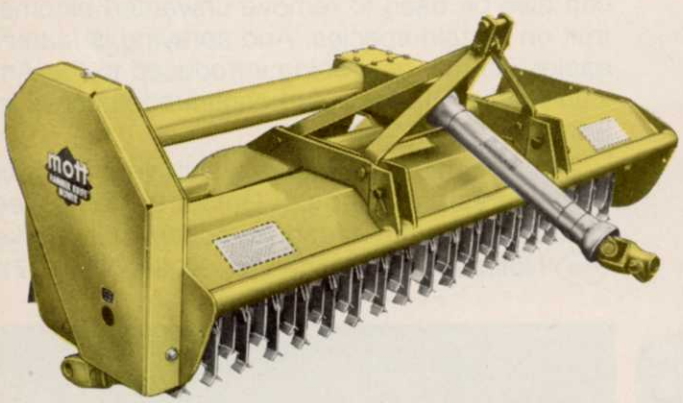

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Engine *from page 38*

even scoring on the bearing surfaces because there was not enough clearance between the rod and the crankshaft.

If the rod was not tightened to the correct torque, the mating surface will have a peened effect caused by the two sections of the rod pounding together. A dull gray finish — called fretting — would be the result if the two rod sections were not quite loose enough to cause peening but still loose enough for the two parts to work against each other.

If the mating surfaces have indicated a loose connection, check the bolts. If a bolt is polished all the way around it means it was turning or backing out. If it is polished only on one side, that indicates that the bolt was stationary.

The fourth area you should examine are breaks. Look along the sides of any breaks for faults such as pock marks.

One last area that should be considered is oil pump failure if the engine is pressure lubricated. Examine the pump carefully for failure. Check the oil galleries to be sure that they were not restricted or completely plugged.

At this point, you have made a very thorough examination of your engine. You have noted the condition of the oil as you found it, the state of the air cleaning system, and any marks on pistons and rings. From these observations you can identify the cause of this particular engine failure.

Determining the cause of the failure would be strictly an academic exercise unless you plan to do something about it. If lack of lubrication seemed to be the problem, certainly you would pay extra attention to that in your regular maintenance schedule. If your air cleaner was dirty or grass screen clogged, you would make a note to check these more frequently.

By finding out what causes an engine problem, then taking steps to correct the problem, you can reduce the frequency of engine repair and costly downtime.

A bit of failure analysis is all it takes — and it's worth it. **WTT**

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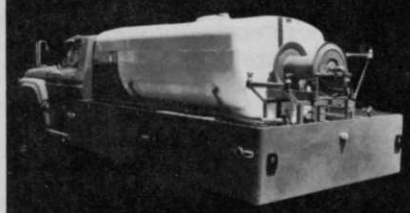
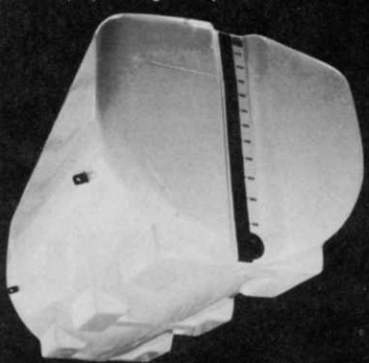


Model #PC 1200 fiberglass tank equipped with fiberglass pump cover, Model #D 200 gallon mixing tank shown mounted on a custom truck body by Strong Enterprises.



Bottom view of the Model #PC 1200 tank showing to best advantage the integral molded mounting base and steel hold-down lugs designed for ease in mounting on your truck and eliminating costly installation.

THE Tuflex Manufacturing process allows a five year warranty on all tanks.

Tuflex is the only manufacturer to specialize in *seamless* fiberglass spray tanks specifically for the pest control and lawn care industry. Remember when craftsmanship was an art... at Tuflex it still is! The exclusive Tuflex process carries a full five year warranty on all handcrafted seamless fiberglass tanks.

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Port Everglades, Florida 33316
(305) 525-8815

Circle **147** on free information card

WT&T PRODUCTS

A hydraulic dump box for the Toro Workmaster is available from Dedoes Industries, Inc. Its hydraulic system and brackets quickly mount under the vehicle's bed. The dump box holds 1,000 pounds.

Circle 701 on free information card

A monofilament trimmer, the WC-22, uses a loop-type handlebar with anti-vibration grip so the operator can work with one hand on the bar and the other on the shaft. This handling position gives the operator close control in an area distant from his feet.

The trimmer also contains a gasoline-powered motor mounted on the top of the shaft and a shoulder strap. The manufacturer, Hoffco, Inc., offers an adapter kit to substitute its other models with the handlebar arrangement.

Circle 702 on free information card

Woodsman model 6003-DH clears and reclaims land, prepares sites, and cleans up landfill. An operator can clear 3 acres of land in a day, cutting through heavy brush, 6-inch diameter trees, trash lumber, and other ligneous debris. The machine leaves a layer of wood chips in its path; the land is ready for immediate use.

A diesel engine with hydrostatic drive protects the engine from shock loads at the rotor. A remote control panel mounts on the prime mover and provides the operator with convenient controls for starting, speed selection, rotor disengaging, and stopping. The land clearer attaches to front-end loaders and other equipment which handles 6,000 pounds.

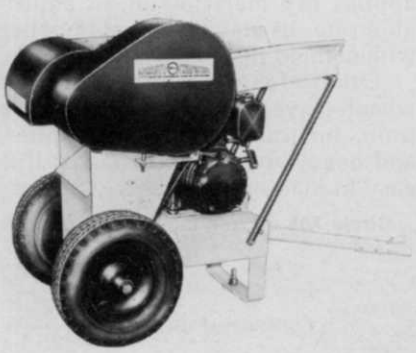
Adjustable skids permit cutting from ground level to 5 inches above. Tree pushers protect the operator and direct trees into the machine's path for efficient cutting. A 60-inch-wide rotary assembly consists of 20 19-inch-diameter discs and 38 heat-treated, alloy steel cutters which are double-edged, free-swinging, and easily reversed or replaced.

Circle 703 on free information card

Parsons T-8 trencher, introduced by the Seaman Co., digs 30 feet deep through even the toughest earth. The 7½-horsepower machine is a hand-bar-type with hydraulic ground drive for variable trenching speeds from 0 to 15 f.p.m. Differential action may be manually locked out for positive traction.

Transport speeds — forward, reverse, and free wheel — vary from 0 to 40 f.p.m. The trencher is easy to operate, and because it's hydraulic, there are few moving parts for quick and easy maintenance.

Circle 704 on free information card



Lickity Chipster, a rugged brush chipper from Piqua Engineering, Inc., turns 2-inch-diameter limbs into usable mulch. Chips leave through a screen and are directed through the hood to containers or the ground. The mulch is useful for municipal parks, streets, and recreation areas, plus around trees, shrubbery, and flower beds.

Circle 705 on free information card

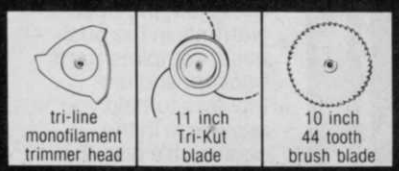
HOFFCO ™
Whizz Witch

A tough 85cc engine stands behind trimming head and 2 cutting blades.

- **Tri-line, heavy duty monofilament trimmer head.**
- **11″ Tri-Kut weed blade cuts heavy weeds, briars and brambles.**
- **10″ 44 tooth brush blade (optional) cuts 3″ diameter saplings at ground level.**

BRUSHCUTTER/POWER SCYTHE

Offers the same equipment package, but the trimmer head is optional.



The 2 cycle, 22.5cc engine, can be operated in any position. Total wgt. 13½ lbs.

1. Monofilament trimmer head
2. 8″ Tri-Kut blade
3. (optional) 8″–44 tooth brush blade

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Brushette T.M.

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Also attaches easily to most lightweight chain saws. • 8″ Tri-Kut weed blade • 8″ 44 tooth brush blade • optional monofilament trimmer • Use for overhead tree and brush trimming.

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The carrying harness and handlebars with anti-vibration grips can be adjusted for the comfort, balance and separates operator from cutting and trimming heads.

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___ **Trimette**—CSA-monofilament trimmer
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***Combination Unit**—Power Scythe • Brushcutter • Monofilament

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Design features of the 450B crawler include a raised operator's compartment and sloping hood for improved visibility, easier entry and exit, and simple maintenance to the main mechanical parts. Power on both tracks maneuvers the J I Case Co. machine with little surface ground distrubance.

The hydraulic angle/tilt dozer efficiently operates through on-the-go blade position from the operator's seat. A single lever controls bucket lift and dump. A four-cylinder diesel engine powers the crawler.

Circle 706 on free information card

LS-50 splits logs 31 inches long under 22,000 pounds of hydraulic force. The log splitter mounts on the three-point hitch of a category 1 or 2 tractor and utilizes the tractor's hydraulic system. A single hydraulic lever moves the cutting wedge. Vermeer Manufacturing Co. manufactures the 570-pound attachment, which has its own dismounting stand.

Circle 707 on free information card

A large capacity hopper with emptying shoot on the Moto-Cast spreader increases your work load and reduces time on the lawn. The Leisure Lawn, Inc., product evenly applies dry materials at an adjustable rate. Its stainless steel impeller with slanted deck is also adjustable.

Other features include front wheel drive, constant speed drive train, turftrac tires, torque limiter, and heavyduty welded chassis. It is easy to load onto a truck.

Circle 708 on free information card

Continues on page 53

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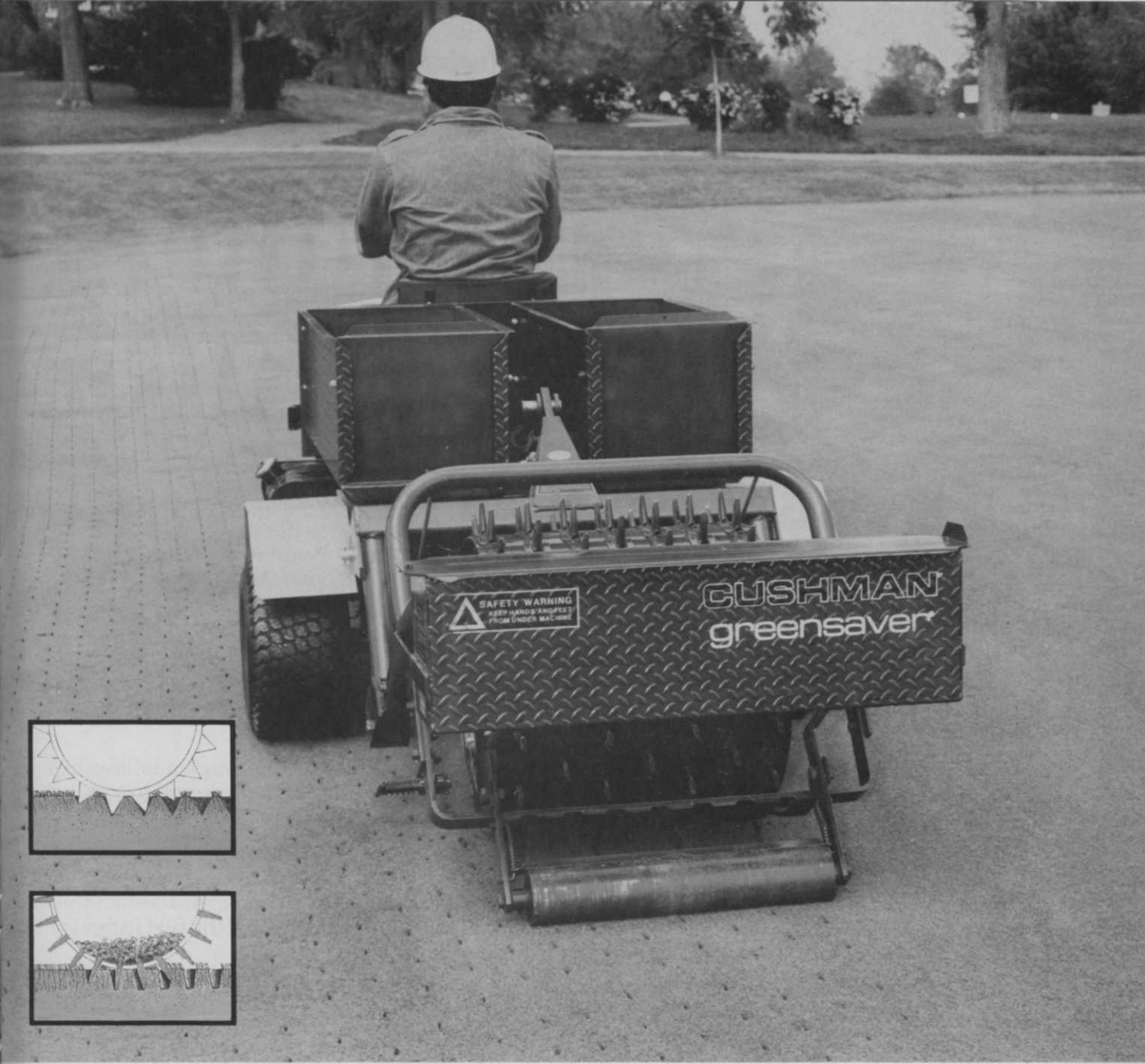

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Now you can, with the Cushman Greensaver aerator. Three interchangeable drums let you pick the type of tines that are right for the soil and the season, while you aerate up to ten times faster than walk-behind aerators.

The Greensaver attaches easily to any Cushman Turf-Truckster chassis equipped with the hydraulic system and dump set. You travel between areas quickly, raising and lowering the Greensaver without leaving the driver's seat.

The standard ½" coring drum provides maximum soil removal for normal aeration. In the fall, during slow-growth periods, you can use the ⅜" coring drum to remove less soil. And for the hot stress periods of summer, you can use the slicing drum.

With the coring drums you can collect the cores as you aerate, or leave them on the turf. Either way you get an accurate 3¼" x 4" pattern of holes up to 2½" deep.

Ask your Cushman Turf dealer to show you a Turf-Truckster® vehicle equipped with the Greensaver aerator. And find out how you can get fast, easy, accurate aeration that changes with the seasons.

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Professor H. B. Musser devoted his career to grass seed research. As a tribute to this outstanding Pennsylvania State University Turf Seed Agronomist, the Musser Foundation was formed.

The foundation's purpose is to assist graduate students in turf research through a fellowship program. This means students who have finished their undergraduate work and are going into turf research may receive financial assistance at this critical point in their careers. Only the interest earned from the H. B. Musser Fund will be used for fellowships, so the dollars you contribute keep on working in perpetuity.

If you or your company are involved in the sale or use of turfgrass or turfgrass-associated products or services, there's no better way to help yourself and the future of the turf industry than an annual contribution to the Musser Foundation.

Contributions may be made in the name of a loved one through the Memorial Fund, or to the Turfgrass Research Fellowship Fund.

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A nonprofit organization dedicated to fostering Turfgrass as a learned profession; to enhancing the lives of people all over the world through Turfgrass, and to supporting education and research in Turfgrass development and management.

Products

from page 50

Model GTL-140 gas-powered trimmer from Echo, Inc. comes with a flexible plastic blade which the manufacturer claims is easier to use than nylon line yet trims grass and weeds like a steel blade. Its 13.8cc Kioritz engine is on the lower end of the shaft to eliminate the need for an expensive flex shaft.

The forward handle adjusts to fit the operator and maintain correct balance when using the trimmer. The stop switch and throttle are on the pistol-grip, rear handle. Weight of the trimmer is 8.1 pounds.

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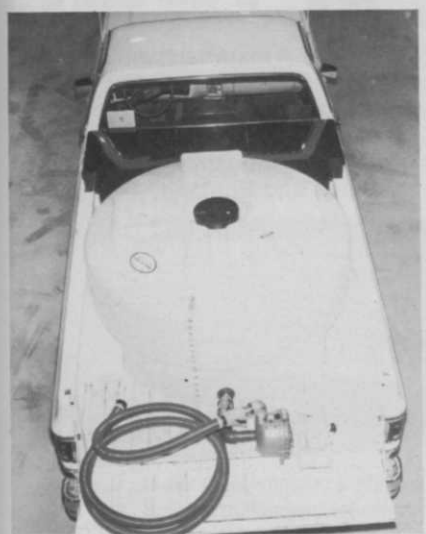

Dura-Life 350-gallon tank for liquids fits all ½-ton and larger pick-up beds, even with the tool box and/or fuel tank still in the bed. Its round shape reduces surges, which can be uncomfortable and dangerous. The Kerrco, Inc. tank holds water, chemical sprays, and fertilizers. It is made of tough linear polyethylene which inhibits sunlight, and weighs 110 pounds.

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SOLO's Junior-410 and PORT-423 are the most imitated portable Mist Blowers in the world ... but they're still number one! They're your best buy for plant protection and pest control in those hard-to-reach places. They're versatile, too, and precision-engineered to give long trouble-free service.

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And its standard power steering gives you effortless maneuverability.

Let Satoh satisfy your tractor requirements like a pro. It satisfies mine.

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Get it at your **SATOH** *tractor dealer.*
P.O. Box 5020, New York, N.Y. 10022

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Growth Regulators *from page 36*

ryegrass the other) has been used successfully. The ryegrass germinated quickly and competed with annual bluegrass but did not compete with the bentgrass once the bentgrass matured. Research to date has indicated that the conversion of a bentgrass-annual bluegrass stand to predominately bentgrass is a more gradual process than converting a Kentucky bluegrass-annual bluegrass mixture to predominately Kentucky bluegrass.

Three consecutive fall applications (usually with overseeding) appear necessary for significant annual bluegrass control. After three years, it must be decided whether to continue application or initiate a preemergence program. Application of preemergence materials, may preclude further fall overseeding and for all practical purposes eliminate fall aerification programs.

Are there drawbacks?

Although the cost of applying MH at 1.5 lbs/A can be justified, this type of annual bluegrass control program requires excellent communication with club officials. Due to the discoloration associated with application of MH (even though it occurs in late fall and winter), it is important that those using the golf course be informed.

Spray equipment must be **precisely calibrated** and functioning properly (new nozzles, proper overlap, etc.). Sloppy applications of MH will be very obvious, particularly when severe discoloration occurs with colder weather.

Fall application of MH on turf-type perennial ryegrasses has caused stand losses over the winter. Therefore, caution should be exercised when treating areas that have been overseeded with perennial ryegrasses.

Initially, use of MH for annual bluegrass control should be tried on a limited scale in combination with overseeding. Observation of the treated area will assist the superintendent in determining the amount of discoloration at his location and the amount of control. Also, any sprayer problems can be identified and corrected before expanding the program. Several golf course superintendents have initiated annual bluegrass control programs with fall applied MH and in almost all cases, they have increased the use of the program. **WTT**

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WT&T CLASSIFIEDS

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, Dorothy Lowe, Box 6951, Cleveland, Ohio 44101.

Rates: All classifications 65¢ per word. Box number, $1. All classified ads must be received by Publisher the 5th of the month preceding publication date and be accompanied by cash or money order covering full payment. Mail ad copy to: Dorothy Lowe, Weeds, Trees & Turf, P.O. Box 6951, Cleveland, Ohio 44101.

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GOLF COURSE TURF PROFESSIONALS: An opportunity to sell Pro Turf© products. ProTurf Division of O.M. Scott & Sons, the nation's leading manufacturer and marketer of professional turf products, has openings for Technical Representatives in several territories. The Tech Reps selected will call on golf course superintendents, requiring a knowledge of turf management and an understanding of these professionals' needs. Applicant should have a BS degree or equivalent in one of the agronomic sciences. Excellent starting salary plus bonus, automobile, and a comprehensive benefits program at no cost to employees go along with these positions. Send resume in confidence to Dick Stahl, Director of ProTurf, O.M. Scott & Sons, Marysville, Ohio 43040. An equal opportunity employer.

SOIL-WATER and turfgrass advisor — Alameda County. Conduct an extension education and research program in urban nonfood agriculture with emphasis on informing a wide range of clientele on water use, soil management and turfgrass adaptability. Teach and develop new information; coordinate and cooperate with agencies, organizations, and other advisors. Communication skills important. M.S. in water and/or soil science, agronomy or horticulture preferred; B.S. and experience required. Closing date: September 15, 1979. Refer to No. 7920. Contact: Personnel Administrator, Cooperative Extension, University of California, Berkeley, CA 94720.

OBERLIN COLLEGE, OBERLIN, OHIO. Position available: Grounds Supervisor. Qualifications: Training in horticulture and landscape planning, preferably with supervisory experience. Responsibilities: Working supervisor of a 9-person grounds crew in the maintenance and development of plantings on a 400-acre campus. Salary: $13,200 to $19,800 depending on qualifications and experience. Applicants should send a resume and arrange for three references to be sent to: D. E. Livingston, Vice President for Business & Finance, Oberlin College, Oberlin, Ohio 44074. Equal Opportunity/Affirmative Action Employer.

LOOKING FOR experienced person who has good knowledge of the fumigation business for NY metro area. Must be able to take charge of complete operation and have sales ability. Please send resume and salary requirements to Box 448, Pest Control, Box 6951, Cleveland, Ohio 44101.

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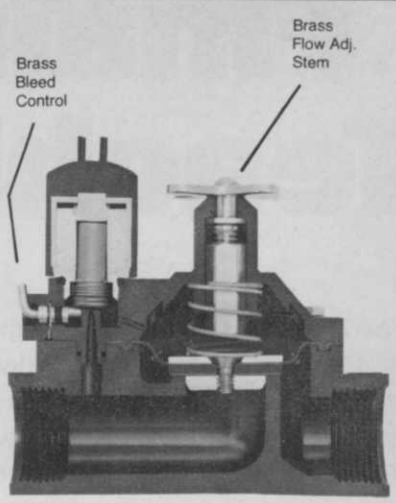

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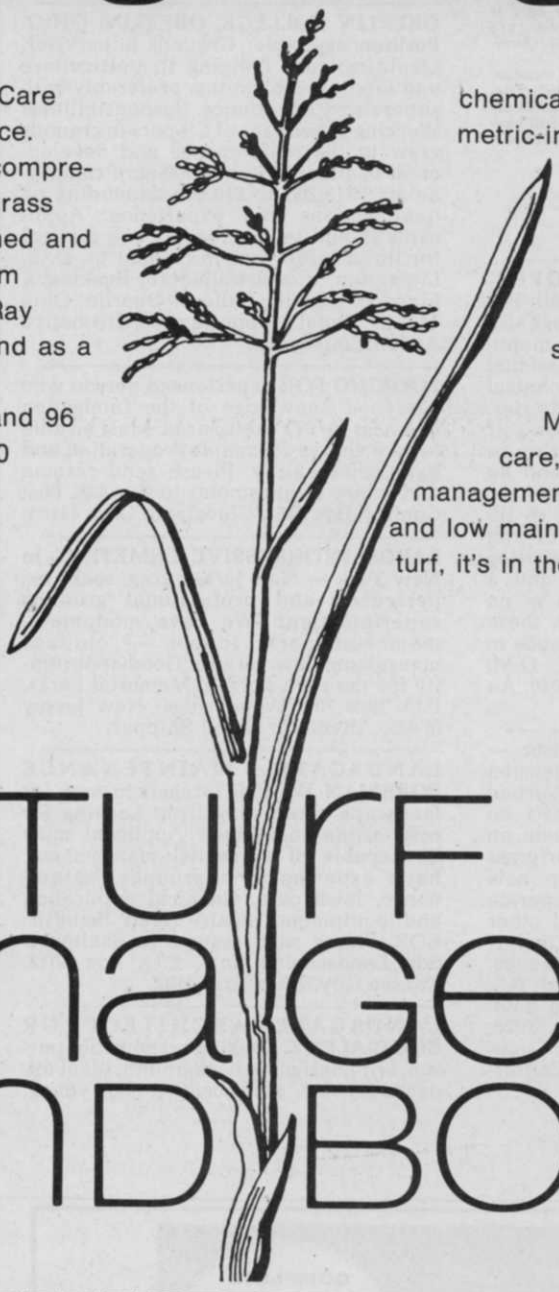
Finally, An Aid For Teaching Turfgrass



Superintendents, Contractors, Lawn Care Managers, New, On-the-Job Reference. The Turf Managers' Handbook is a comprehensive, organized approach to turfgrass science and care. It has been designed and written by leading turf specialists from Purdue, Dr. William Daniel and Dr. Ray Freeborg, for on-the-job reference and as a text for students.

The book contains 150 illustrations and 96 color photographs. Data includes 240 tables and forms. Included are specifications for rootzones, employment, calculations for chemical applications, and extensive metric-imperial conversion. Business and technical aspects of turfgrass management are covered in this 424-page Planning, purchasing, hiring, construction, and plant selection are put together for easy on-the-job reference. Markets covered include lawn care, sod production, golf course management, cemeteries, athletic fields, and low maintenance areas. If it concerns turf, it's in the Turf Managers' Handbook.

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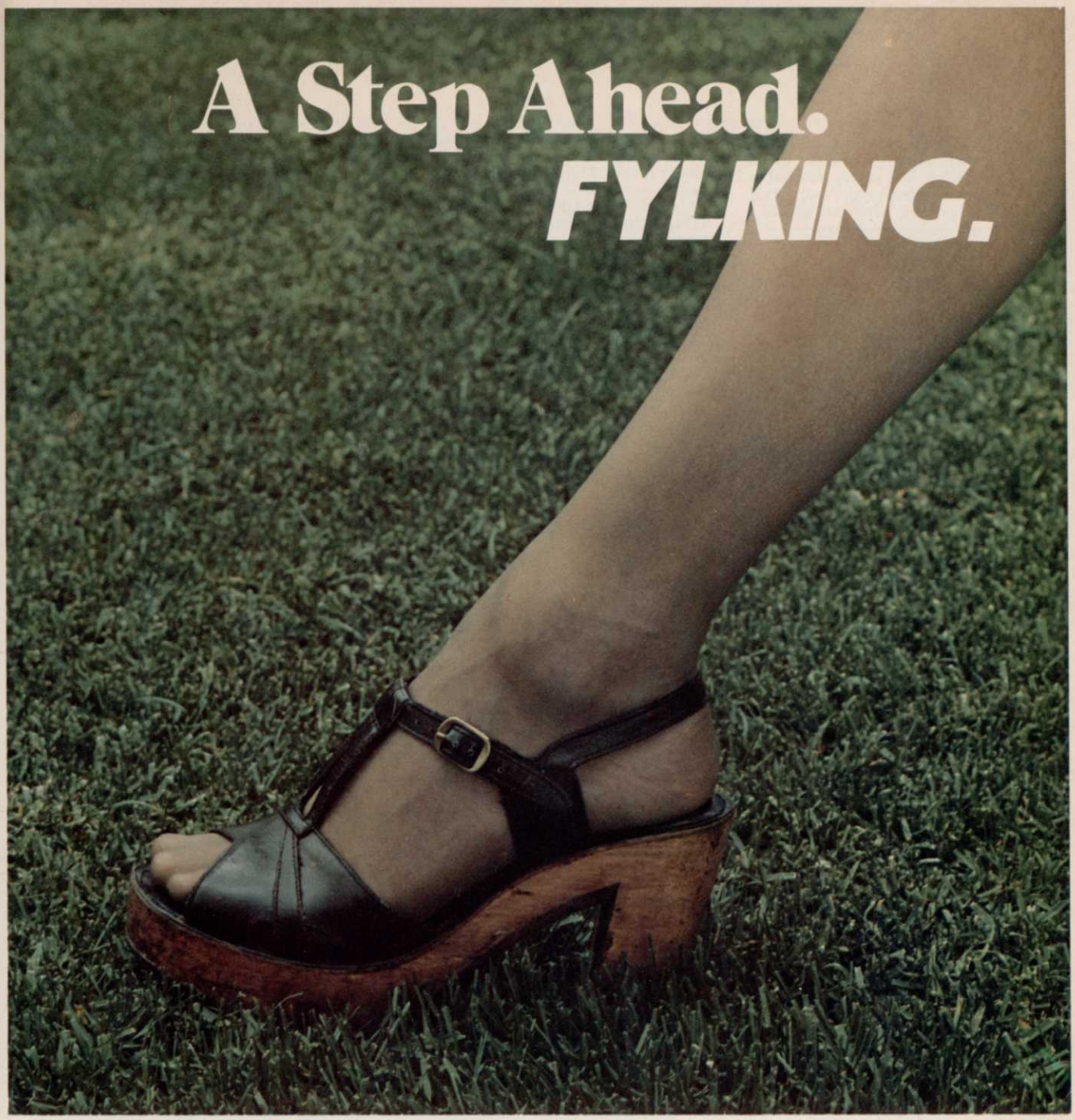

When this low-growing, Swedish lawn beauty first stepped into the turf world it revolutionized the lawn industry.

Now another step! Fylking Kentucky bluegrass costs less than most other elite bluegrasses!

Fylking establishes fast, develops a greater density of rhizomes and root system. Fine-textured, velvety green, Fylking performs well when cut low (even low as one-half inch), and may need less mowing. Amazingly tough, Fylking Kentucky bluegrass has improved disease resistance to leaf spot, stripe smut, stem rust and leaf rust, as rated in tests by many major universities and institutions. Physically pure, genetically true seed, Fylking contains no annual bluegrass (Poa annua), bent grass or short-awned foxtail.

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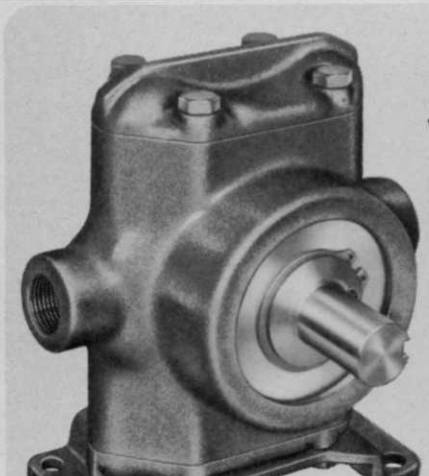
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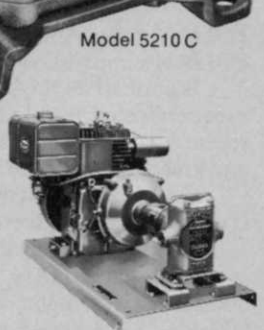
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WT&T EVENTS

TAN-Misslark Convention & Trade Show, Dallas Convention Center, Dallas, TX, **August 18-21.** Contact B.R. Fullingim, TAN, 512 East Riverside Dr., Austin, TX 78704, 512/444-7489.

Ornamentals Northwest Seminars, Memorial Coliseum, Portland, OR, **August 23-25.** Contact ONW Seminars, Extension Business Office, Oregon State University, Corvallis, OR 97331. 503/754-3311.

Tennessee Nurserymen's Association Annual Convention, Opryland Hotel, Nashville, TN, **August 23-25.** Contact Dr. Neil L. Woodiel, P.O. Box 57, McMinnville, TN 37110.

International Exhibition of Groundsmanship, University of London Athletic Ground, Motspur Par, New Malden, Surrey, England, **Sept. 11-13.** Contact Institute of Groundsmanship, 108A Chessington Rd., West Ewell, Surrey KT19 9UR, England. 01-393-8027.

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Oregon Association of Nurserymen annual convention, Kah-nee-ta, Warm Springs Reservation, OR. **Sept. 13-16.** Contact OAN, 0224 SW. Hamilton, Porland, OR 97201.

Garden Industry of America Conference and Trade Show, Convention and Expo Center, Cincinnati, OH, **Sept. 14-16.** Contact GIA, Box 67, Minneapolis, MN 55440.

Tree Evaluation Workshop, Ohio Agricultural Research and Development Center, Wooster, OH. **Sept. 18-19** Contact Alan D. Cook, 7770 Jacksontown Rd. S. E., Newark, OH 43055.

Virginia Tech Turfgrass Field Days and Trade Show, Virginia Polytechnic Institute and State University, Blacksburg, VA, **Sept. 19-20.** Contact J.F. Shoulders, Cooperative Extension Service, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

International Garden Trade Fair, Cologne, Germany, **Sept. 23-25.** Contact Hans Teetz, German-American Chamber of Commerce, 666 5th Ave., New York, N.Y. 10019. 212/582-7782.

Drip Irrigation course, Anaheim, CA, **Sept. 25-27.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906. 301/871-8188.

Entomological Society of America 51st Annual Meeting, The Hotel Hershey, Hershey, PA, **Sept. 26-28.** Contact G. L. Jubb, Jr., Sec.-Treas., Eastern Branch, ESA, Pa. Agric. Exp. Stn., 662 N. Cemetery Rd., North East, PA 16428.

Florida Turf-Grass 27th Annual Conference and Show, Holiday Inn Central and Curtis Hixon Convention Center, Tampa, FL, **Oct. 14-17.** Contact FT-GA Executive Office, 1520 Edgewater Drive, Suite E, Orlando, FL 32804. 305/425-1581.

Turf Irrigation course, San Diego, CA, **Oct. 16 18.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906. 301/871-8188.

Washington State Weed Association 29th Annual Conference, Town Plaza Motor Inn, Yakima, WA, **Nov. 7-9.** Contact the Weed Science Society of America, 113 North Neil St. 311 Illinois Bldg., Champaign, IL 61820. 217/356-3182.

North Carolina Recreation & Park Society Annual Conference, Civic Center, Raleigh, NC. **Nov. 11-14.** Contact William J. Scott, President NCRPS, PO Box 1668, Laurinburg, NC 28352.

New York State Turfgrass Trade Show, Syracuse, NY, **November 13-15.** Contact Janet Worthington Dudones, 50 Petrova Ave., Saranac Lake, NY 12983.

Planning and Budgeting Symposium, Ramada Inn O'Hare, Chicago, IL, **November 15-16.** Contact ALCA, 1750 Old Meadow Rd., McLean, VA 22102.

Center Pivot Irrigation course, Lincoln, NE, **Nov. 27-29.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906. 301/871-8188.

Design/Build Symposium, Kansas City, MO, **November 28-30.** Contact ALCA, 1750 Old Meadow Rd., McLean, VA 22102.

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